Single Tooth Prosthetic Restoration Through Surgical Crown Lengthening, Conservative Therapies and CAD-CAM Milled Restoration in Lithium-Disilicate: A Case Report

Protetička restauracija pojedinačnog zuba kirurškim produljenjem krune, konzervativnom terapijom i litijevim disilikatnim nadomjestkom proizvedenim CAD-CAM tehnologijom: prikaz slučaja

Introduction

The restoration of serious tooth decay often requires an interdisciplinary approach. For example, the dentist can be required to restore esthetics and function of an upper premolar, where the esthetics and the entity of the masticatory loads are often affecting the choice of procedures and materials and even general prognosis of the tooth.

In fact, there are lots of influences to consider in this case: position and size of the cavity; requirement of endodontic

Uvod

Restauracija znatno oštećenog zuba često zahtijeva interdisciplinarni pristup. Na primjer, od kliničara se može zahtijevati rekonstrukcija estetike i funkcije gornjeg pretkutnjaka, no pritom estetski zahtjevi i žvačno opterećenje često utječu na izbor postupaka i materijala, pa čak i na opću prognozu zuba.

U ovom slučaju nekoliko je čimbenika o kojima treba voditi računa – to su položaj i veličina kaviteta, potreba za endodontic

Abstract

Objective. The restorative treatment of a decayed, non-vital upper premolar often requires an interdisciplinary approach. Esthetics and the entity of the masticatory loads are usually affecting the choice of procedures and materials. A conservative treatment in a case with esthetic needs and functional requirements is investigated in this case report. Materials and methods. A case of a 45-year-old woman with a severely decayed upper premolar is presented. The tooth has been previously treated in an emergency department with a provisional endodontic medication, but a further treatment has been then performed. The tooth was painful at the moment of the visit and the carious lesion appeared to invade the subgingival level. A surgical-conservative approach has been selected involving crown lengthening, endodontic treatment and a prosthetic crown with a monolithic Lithium-Silicate. Results. The rehabilitative process required 3 months, including maturation times after surgery and the placement of the provisional crown. The patient claimed to be both esthetically and functionally satisfied with the restoration. Conclusion. A conservative treatment of a severely involved tooth requires a critical evaluation of the remaining structures and a precise selection of the restorative materials. A monolithic crown could represent an ideal solution for restoring an upper premolar requiring esthetics and solid function, but the choice of a high translucent, easily polishable and possibly even chair-side prosthetic material might be an appreciable added value for clinicians.

Key words

Bicuspid; Crown Lengthening; Crowns

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treatment; size of the future restoration; requirement of endodontic post; requirement of prosthetic rehabilitation; position of the bone crest; length of the root; status of teeth adjacent to a single-tooth; oral hygiene and the patient's compliance; cost.

In many cases, when the rehabilitation plan of a premolar includes different and complex treatments such as endodontic treatments, posts or extensive restorations, the dentist tends to choose an implant-supported prosthetic rehabilitation, because the costs of the above mentioned conservative treatments could be similar to those of the implant-supported ones, but the overall prognosis of a tooth-supported prosthesis may be, in the mind of professionals and in the literature, lower than that of a crown over implant (1, 2). The prognosis of both rehabilitations is strongly affected by different factors such as the surgeon, his skills, used materials, the patient's habits, and a definite conclusion concerning the best solution to the problem; either endodontic treatment or implant-supported therapy, still cannot be reached (3).

However, the rehabilitative treatment of a natural tooth is usually faster and the conservative treatment represents, biologically and when possible, always the best choice. In this case, the right selection of prosthetic materials could be decisive.

Case report

A 45-year-old woman patient, B.S., visited the dental clinic of the IRCCS Istituto Ortopedico Galeazzi (Milan, Italy) reporting the pain in her upper left dental arch. When her medical history was taken, she stated that she was not a smoker, was not affected by any chronic disease and was in good health.

During the clinical oral examination, she did not exhibit any mucosal lesions, she presented a good level of oral hygiene but there were numerous incongruous restorations, especially a temporary-like restoration on tooth #25.

This tooth was not stimulated with the cold test and the radiographic image revealed an incomplete endodontic treatment (Figures 1-2). The tooth seemed to present a suitable root length for a conservative restoration, but the apical position of the carious lesion and the proximity of the interdental bone ridge did not allow a correct rehabilitation with prosthetic crown, respecting the biological width (4).

Considering the patient's factors (e.g. age, level of oral hygiene, absence of smoking or other risk factors) and status of the tooth (e.g. length of the root, endodontic access, periodontal status), therefore, it was communicated to the patient that the treatment plan would include:

- Pre-endodontic restoration in a suitable material to obtain a complete sealing even on the subgingival dentin.
- Root canal therapy of the tooth.
- Surgical crown lengthening for an optimal adhesion (5, 6).
- Permanent restoration using a composite material with the insertion of an endodontic fiber post (7, 8, 9).
- Prosthetic preparation of the tooth with the BOPT technique and the placement of a temporary crown (10, 11).
- Placement of the definitive crown in a material that will be suitable for a new clinical situation.

dodontic liječenjem, veličina buduće restauracije, potreba za intrakanalnom nadogradnjom i protetičkom rehabilitacijom, položaj koštanoga grebena, duljina korištena, stanje su-sjednih zuba, oralna higijena i pacijentova suradnja te cijena.

Često, kada plan za rehabilitaciju prekretnjaka uključuje različite i složene zahvate poput endodontskog liječenja, nadogradnji ili velikih restauracija, kliničar odabire implanto-protetičko liječenje jer troškovi konzervativne terapije mogu biti slični kao i oni za implantate, ali ukupna prognoza na domjesta na prirodnom zubu može, prema dijelu literaturu, biti nepovoljnija u odnosu prema implantoprotetičkim na domjestcima (1, 2). Na prognozu u oba slučaja snažno utječu različiti čimbenici, uglavnom kliničar i njegova vještina, zatim korišteni materijali i pacijentove navike, pa se ne može donijeti konačni zaključak o tome koje je rješenje najbolje – terapija nadomjestkom na prirodnom zubu ili implantatu (3).

No terapijski koncepti koji uključuju prirodne zube obično su brži i konzervativno liječenje najbolji je izbor kad god je to moguće, a u ovom slučaju mogao bi biti presudan pravi izbor protetičkog materijala.

Prikaz slučaja

Pacijentica u dobi od 45 godina – B. S., došla je u stomatološku kliniku IRCCS Ortopedskoga instituta Galeazzi (Milano, Italija) zbog bolova lijevo u gornjem zubnom luku. Tijekom anamneze navela je da ne puši, nema ni jednu kroničnu bolesti i dobro je općega zdravlja.

Tijekom kliničkoga oralnog pregleda nisu pronadena oštećenja sluznice, razina oralne higijene bila je dobra, ali s mnogo insuficijentnih restauracija i privremenim ispunom na zubu 25.

Taj zub nije reagirao na test hladnoćom, a rendgenska snimka otkrila je nepotpuno endodontsko liječenje (slike 1 i 2). Čini se da je imao odgovarajuću duljinu korištena za konzervativno liječenje, ali, zbog potrebne biološke širine, apikalni položaj karijesne lezije i blizina interdentalnoga koštanog grebena nisu dopuštaли ispravnu rehabilitaciju protetičkom krunicom (4).

Uzimajući u obzir čimbenike povezane s pacijentom (npr. dob, razinu oralne higijene, pušenje ili druge rizicne čimbenike i status zuba), pacijentica je rečeno da će plan liječenja uključivati:

- predendontsku restauraciju odgovarajućim materijalom kako bi se postiglo potpuno brtvljenje, čak i na subgingivnom dentinu
- endodontsko liječenje zuba
- kirurško produljenje krune kako bi se izložio dio zdravog dentina za optimalnu adheziju (5, 6)
- trajnu opskrbu kompozitnim materijalom, uz korištenje kompozitne nadogradnje ojačane vlaknima (7, 8, 9)
- protetičku preparaciju zuba BOPT tehnikom i postavljanje privremenе krunice (10, 11)
- izradu trajne krunice u materijalu koji će odgovarati no-voj kliničkoj situaciji.
Operational phases

The first step consisted of the removal of the decayed tissue of the distal face of the tooth 25 in its coronal portion and in the first third of the root.

The cervical limit of the decay has been exposed, then the wall has been reconstructed with a glass ionomer material (EQUIA Forte™, GC Corp, Tokyo, Japan) coated with the light curable EQUIA Forte Coat™ to obtain a more resistant material even in case of occlusal loads (12-14). Glass ionomer material has been chosen because the apical edge of the tooth cavity was under the gingival margin; therefore, it was impossible to obtain a correct isolation for a composite restoration. It has been confirmed that the glass ionomer materials can tolerate acid and humid environments more than composites (12-14).

The EQUIA Forte was selected among different glass ionomer cements since it has been reported in the literature that it has better long-term results (12-16).

After that, the endodontic treatment of the tooth has been performed. The tooth had only one root canal, processed with a hand file READY STEEL K-File™ (Dentsply Sirona, Italy) and, for the shaping and refinement, with mechanical file PROTAPER GOLD™ (Dentsply Sirona, Italy) at a working length of 20 mm.

The sealing of the canal has been performed with a Thermafil™ cone (Dentsply Sirona, Italy) with an apical diameter of 0.30 mm. (Figure 3)

The third step of the treatment consisted of the crown lengthening, necessary to expose an adequate part of the root, to obtain, after healing, the correct adhesion of the composite for the pre-prosthetic restoration and the successive prosthetic rehabilitation.

After the surgical flap elevation of the tissue and the bone remodeling, the flap was repositioned apically and sutured with vertical mattress suture anchored in the periosteum. The suture was removed after 7 days.

During the fourth phase, after waiting for a postsurgical healing time of 4 weeks necessary for the correct maturation of the tissues, the glass ionomer and coronal part of the endodontic material has been removed with the Gates Glidden™ cutters (Dentsply Sirona, Italy) with 01-02-03 size, it has been inserted a glass fiber post with a medium size truncated cone form, Anatomical Post (DENTALICA, Italy), fixed by a self-adhesive dual-cure cement (GCem LinkAce™ translucent, GC Corp, Tokyo, Japan). The permanent composite restoration was completed with the Gaenial Posterior™ shade A3 composite (GC Corp, Tokyo, Japan) bonded with its respective self-etch adhesive (Gaenial Bond™).

After the restoration, the tooth was prepared with the B.O.P.T technique and a provisional crown in PMMA, obtained with an optical scan done before the preparation of the element with a AADVA IOS100 scanner (GC Corp, Tokyo, Japan), was placed. During this phase the old restorations of the teeth 24 and 26 were replaced (Figures 4-5), (10, 11).

After another 4 weeks, the refinement of the prosthetic abutment was performed and the definitive dental impression with Polyvinylsiloxan-Ether (PVS-E, Exa’Lence™, GC Corp., Tokyo, Japan) (figure 6) was taken. The dental impression was passed in the laboratory and the definitive impression was repeated (GC Corp., Tokyo, Japan). A light curing EQUIA Forte™ to obtain a more resistant restoration was completed with the Gaenial Posterior™ shade A3 composite (GC Corp, Tokyo, Japan) bonded with its respective self-etch adhesive (Gaenial Bond™).

Klinički postupci

Prvi potez sastoji se u uklanjanju karoizognog tkiva s distalne strane zuba 25 u njegovu koronarnom dijelu i u prvoj trećini korijena.

Otkrivena je cervikalna granica karijesa, a zatim je stijenka rekonstruirana stakleno-ionomernim cementom (EQUIA Forte™, GC Corp, Tokio, Japan) resuvućenim svjetlosno-polimerizirajućim premazom EQUIA Forte Coat™ kako bi se dobio otporniji material i u slučaju polukluznog opterećenja (12 – 14). Odabran je stakleno-ionomerni materijal jer je apikalan rub kaviteta bio smješten subgingivno, pa je bilo nemoguće postići apsolutnu izolaciju za kompozitnu restauraciju – sada je sigurno da stakleno-ionomerni materijal mogu podnijeti kiselo i vlažno okružje bolje od kompozita (12 – 14).

Između različitih stakleno-ionomernih cemenata odabran je EQUIA Forte jer je prema literaturi pokazao bolje dugročne rezultate (12 – 16).

Nakon toga provedeno je endodontsko liječenje. Zub je imao samo jedan korijski kanal koji je obraden ručnim instrumentom READY STEEL K-FILE™ (Dentsply Sirona, Italija), a za oblikovanje i završnu obradu korišten je PROTA- PER GOLD™ (Dentsply Sirona, Italija) na radnoj duljini od 20 mm.

Brvljenje kanala postignuto je štapićem Thermafil™ (Dentsply Sirona, Italija) apikalnog promjera od 0,30 mm (slika 3.)

Treći potez u liječenju sastojao se u nužnom produljenju kliničke krune kako bi se izložio odgovarajući dio korijena da bi se postigla adekvatna adhezija kompozita za pretpreterminu terapiju i protetičku rehabilitaciju.

Nakon kirurškog podizanja režnja i remodeliranja kosti, režanj je pomaknut apikalno i učvršćen vertikalnim madračnim šavom usidreom u periostu. Šav je uklonjen nakon 7 dana.

Tijekom četvrte faze, nakon čekanja poslijekirurskog razdoblja cijeljenja od četiri tjedna potreban je pravilno sazrijevanje tkiva, stakleno-ionomerni cement i koronalni dio endodontskog punila uklonjeni su svrdlom Gates Glidden™ (Dentsply Sirona, Italija) veličine 01-02-03 i umetnuta je kompozitna nadogradnja ojačana staklениm vlaknima srednje veličine Anatomical Post (DENTALICA, Italija) koja je fiksirana samoadehezivnim cementom (GCem LinkAce™ proziran, GC Corp, Tokio, Japan). Trajna kompozitna restauracija izrađena je od materijala Gaenial Posterior™ (GC Corp, Tokio, Japan) u boji A3 i odgovarajućim samojekacirajućim adhezivom (Gaenial Bond™).

Nakon nadogradnje zub je prepravan tehnikom BOPT te je izrađena privremena krunica od PMMA-e na temelju optičkog skena snimljenog prije preparacije skenerom AADVA IOS100 (GC Corp, Tokyo, Japan). Tijekom te faze promijenjene su stare restauracije na zubima 24 i 26 (slike 4. i 5.). (10, 11).

Nakon dodatna četiri tjedna doradene je nosač i uzet je konačni otisak u polivinilsilokanskom eteru (PVS-E, Exa’Lence™, GC Corp., Tokio, Japan) (slika 6.). Otisak je poslan u laboratorij gdje je optički skreniran i prenesen u CAD-CAM jedinicu.
Figure 1 Initial situation. The patient reports a generic pain in the second quadrant, where there is a restoration in temporary material on tooth number 25.

Slika 1. Početna situacija – pacijentica se žalila na bol u drugom kvadrantu gdje postoji privremeni ispup na zubu 25

Figure 2 Initial radiograph showing the presence of an endodontic dressing present for several months, but the treatment has never been completed. Note the depth of the carious lesion and the proximity of the interdental bone ridge, which may represent an obstacle to prosthetic rehabilitation.

Slika 2. Početna rendgenska snimka pokazuje endodontsko liječenje koje je počelo prije nekoliko mjeseci, ali nikad nije završeno; treba obratiti pozornost na dubinu karijesne lezije i blizinu interdentalnog koštanog grebena, što može biti prepreka za protetičku rehabilitaciju

Figure 3 Radiograph of completed root canal therapy and reconstruction made completely in glass ionomer cement.

Slika 3. Rendgenska snimka nakon dovršene terapije i ispuna od stakleno-ionomernog cementa

Figure 4 Prosthetic preparation of dental element with BOPT technique. Note the minimal aggressiveness in the dental groove, recently traumatized by surgery.

Slika 4. Protetička preparacija zuba tehnikom BOPT; obratiti pozornost na minimalnu agresivnost unutar sulksusa koji je nedavno traumatiziran operacijom

Figure 5 First relining in acrylic resin of the provisional crown in PMMA obtained by digital scanning of the arches, suitable to condition the tissues after only 4 weeks from the surgery, taking advantage of the reparative thrust that follows a periodontal surgery.

Slika 5. Prvo podlago pravljene krunice od PMMA-e dobivene digitalnim skeniranjem lukova akrilatnom smolom, čime se kondicionira tkivo samo četiri tjedna poslije operacije, koristeći se prednostima reparacijskog potencijala koji slijedi nakon parodontno-kirurškog zahvata

Figure 6 Final preparation of the tooth with the aim of taking the definitive impression. Note the total absence of bleeding despite having extended the preparation margins more apically than the first provisional.

Slika 6. Završna preparacija zuba sa svrhom uzimanja konačnog otiska; obratiti pozornost na potpunu odsutnost krvenja, iako je rub preparacije pomaknut apikalno u odnosu prema prvoj privremenoj krunici

Figure 7 The lithium-disilicate crown after polishing and fissure staining.

Slika 7. Litijeva disilikatna krunica nakon poliranja i bojenja fisura

Figure 8 Final image after polymerization and removal of composite cement excesses. Note the excellent integration of the prosthetic margins.

Slika 8. Završna slika nakon polimerizacije i uklanjanja viška kompozitnog cementa; obratiti pozornost na izvrsnu integraciju protetičkih rubova

Figure 9 Final occlusal view.

Slika 9. Završni okluzalni prikaz

Figure 10 Final radiograph of the restoration in its position, which detects an excellent integration of the margins and the respect of the biological width.

Slika 10. Završna rendgenska snimka koja otkriva izvrsnu integraciju rubova i sjajnu biološku širinu
expression was sent to the laboratory, where it has been optically scanned and a CAD-CAM path was set.

As a consequence of the new surgically modified prosthetic margin, the appropriate length of the abutment for an adhesive cementation has been obtained, and the highly esthetic requirement and the contemporary need of covering costs with a monolithic crown, led to the clinical choice of lithium-disilicate crown with high translucency, which is suitable for the CAD-CAM technology.

The chosen material was a lithium disilicate block (GC Corp, Tokyo, Japan), with an ultra-thin structure and two important advantages: first of all, the selected block was made for chairside use and it was easy to be milled, and secondly this kind of materials do not require other steps in the oven to be sintered or glazed. In fact, the selected block is in the group of those completely crystalized, hence the time for its crystallization could be saved and the software for the finishing and glazing did not have to compensate any material contraction due to the temperature in the crystallizing oven. 17

In this way, the margins remain extremely thin and clear and it was particularly useful in our case. Also, it was possible to reduce costs compared to the use of a high esthetic and functional material.

Additionally, the ultra-thin structure of selected lithium disilicate blocks permits an easily polishing of the restoration even after the occlusal adjustments, leaving the area extremely uniform and smooth. This reduces the finishing times, the brightness lasts longer and the occlusal contacts produce less abrasion on the restoration and on the antagonists (Figure 7).

Regarding the luting phase, the tooth abutment was etched with 37% orthophosphoric acid for 40 seconds, rinsed and then dried with compressed air. The definitive crown was etched with 6% hydrofluoric acid for 40 seconds, rinsed and dried with compressed air. Since the acid etching with the hydrofluoric acid may result in the formation of crystals of lithium salts on the inner surface of the crown18, it is important to put the crown in hot water for 1 minute after the acid removal, to eliminate the crystals and prevent any interference with the adhesive cementation, and then it must be carefully dried. Before the placement of the adhesive cement, a specific coupling agent was placed in the internal face of the crown in order to obtain a stronger adherence between the ceramic and the luting resin. For this reason the G-Multi Primer (GC Corp, Tokyo, Japan) was selected and applied. The luting phase was finally performed with the G-CEM LinForce™ (GC Corp, Tokyo, Japan), after the placement of the dedicated adhesive system (G-Premio Bond™) on the adhesive surfaces of tooth and crown, blowing them with compressed air for 20 seconds, without curing them before the luting phase in order to allow the correct fitting of the crown. 40 seconds of curing time for each crown surface have been executed (120° in total in order to correctly cure both adhesive and resin cement even through the ceramic) and the excess of the luting material have been finally removed.

Final results

At the end of the procedures, the restoration was precisely set at the level of the gingival margins. It appeared to be mor-

S obzirom na novi kirurški prilagođen protetički rub, dobivena je odgovarajuća površina nosača za adhezivno cementiranje, a visoki estetski zahtjevi i potreba za smanjivanjem troškova naveli su liječnike da izaberu monotinitu krunicu od litijeva disilikata visokog stupnja translucencije pogodnog za CAD-CAM tehnologiju.

Odabrani litijev disilikatni blok (GC Corp, Tokio, Japan) ima ultratanku strukturu i dvije važne prednosti – prva je da je odabrani blok pripremljen za uporabu u ordinaciji i lako se obraduje, a druga, ta vrsta materijala ne zahtijeva sintiranje ili glaziranje u peći. Zapravo je odabrani blok iz skupine materijala koji su potpuno kristalizirani, tako da se može usredotočiti vrijeme za njegovu kristalizaciju, a softver za završnu obradu i glaziranje ne mora kompenzirati kontrakciju materijala zbog temperature u peći za kristalizaciju17.

Na taj način rubovi ostaju iznimno tanki i jasni te su u ovom slučaju posebno korisni, a također je moguće smanjiti troškove u usporedbi s upotrebom drugih visokoestetskih i funkcionalnih materijala.

Už to, ultratanka struktura odabranih litijevih disilikatnih blokova omogućuje jednostavno poliranje restauracije, čak i nakon okluzalnog ubrušavanja, ostavljajući površinu iznimno ujednačenom i glatkom. To skraćuje završnu obradu, svjetлина traje dulje i okluzalni kontakti uzrokuju manje abrazije na restauraciji i antagonistima (slika 7.).

Prijе cementiranja nosač je 40 sekunda jetkan 37-postoronortofosfornom kiselinom, ispran i osušen komprimiranim zrakom. Krunica je jetkana 9-postotnom fluorovodičnom kiselinom 40 sekunda, isprana i osušena komprimiranim zrakom. Budući da jetkanje fluorovodičnom kiselinom može rezultirati stvaranjem kristala litijevih soli na unutarnjoj površini krunice18, važno ju je stavitи u vruću vodu jednu minutu nakon ispiranja kiseline kako bi se uklonili kristali i spriječilo ometanje adhezivne veze, a zatim se mora pažljivo osušiti. Prijе stavljanja adhezivnогa cementа, unutarnja površina krunice premažuje se posebnim veznim sredstvom kako bi se postiglo jače prianjanje između keramike i kompozitnогog nega. Za to je odabrani G-Multi Primer (GC Corp, Tokio, Japan). Za cementiranje je korišten G-CEM LinForce™ (GC Corp, Tokio, Japan), nakon aplikacije namjenskog adhezivnогo sustava (G-Premio Bond™) na vezne površine zuba i krunе i te ispuhivanja komprimiranim zrakom 20 minuta, bez polymerizacije kako bi se omogućilo pravilno sjedanje krunice. Nakon namještanja krunice obavljen је svjetlosna polimerizacija i to 40 sekunda za svaku površinu (ukupno 120 sekunda kako bi se polimerizirali adheziv i cement, čak i kroz keramiku), a višak materijala je uklonjen.
Discussion

This case presents a very frequent case that dentists face during their practice. Due to their position and function, premolars are often affected by tooth decay; hence there is a need for endodontic treatments, posts and even extensive restorations. In this case report, the dentist had to primarily solve pain, consequent to an incomplete endodontic treatment, but then to guarantee enough solidity to whatever is the planned, final rehabilitation. CAD-CAM technology and chairside procedures, including the milling process that takes place completely inside the dental clinic, are actually a valuable reality and these kinds of digital machines have been easily available for many years (12, 17, 19).

In this specific case, the choice has been directed towards a lithium-disilicate ceramic block for the manufacturing of both an esthetic and durable crown. The lithium-disilicate is in fact an ideal material for restorations in molars and premolars, having a very high flexural strength and compressive resistance, but preserving highly esthetic properties, such as translucency, proper light reflection, natural opacity and fluorescence. Even the choice of a monolithic material such as presented in our case is a clear example of how these categories of new millable materials can fit even if there is a demand for esthetic results.

The required time for the complete crown fabrication inside the dental clinic, from designing, milling to finishing, may vary depending on the material: the required fabrication time ranges normally from 1 hour (for the simplest materials) to more than 4 hours (for the materials that after milling require more tests and passages in finishing furnaces. For this reason, and due to the diffusion of CAD-CAM procedures in laboratories, chairside procedures are actually less appreciated by many dentists, who see them as a possible waste of time, diverting them from the real clinical activity. However, the reliability of modern CAD-CAM systems and new materials allow dentists and laboratories to make new choices, even in the name of a smoother workflow and cost control, when possible. A millable material that has considerable esthetic properties is in any case indispensable, whether a clinician decides for a full chairside procedure, or for sending the impression in the laboratory. Also the “monolithic” materials cannot actually afford to be opaque, not very natural and not very translucents, because very few professionals and patients are inclined to accept esthetic compromises in modern times u Zubni luk, s ispravnim kontaktnim točkama i obrim podudarnošću boje sa susjednim zubima (slike 8. i 9.). Na ren- genskoj snimci može se vidjeti da su i rubovi ispod gingive integrirani, bez stepenice ili prostora za zadržavanje plaka koji bi mogli biti problem tijekom održavanja higijene kod kuće (slika 10.). Pacijentica se više ne žali na bolove i zadovoljava je protetičkom rehabilitacijom za koju smatra da se savršeno integrirala i s funkcionalnog i s estetskog stajališta. Također vjeruje da je boja krunice ljepša od prirodnih zuba te se rastipivala o izbjeljivanju.

Rasprava

Ovo je slučaj s kakvim se kliničari često moraju suočiti u praksi. Zbog položaja i funkcije, pretkutnjaci su često podložni velikim oštećenjima i moraju se endodontski liječiti, a potrebne su i nadogradnje te velike restauracije. U ovom slučaju kliničar je najprije morao ukloniti bol, što je posljedica nepotpunog endodontskog liječenja, a zatim osigurati dovoljnu čvrstoću nosača za sve što je planirano. CAD-CAM tehnologija i postupci u ordinaciji, uključujući i glodanje na- domjestka, danas su stvarnost i takvi su digitalni uređaji lako dostupni već godinama (12, 17, 19).

U ovom specifičnom slučaju izbor je pao na litijev disilikat keramički blok za izradu estetske i trajne krunice. Litijev disilikat zapravo je idealan materijal za restauraciju kutnjaka i pretkutnjaka jer su njegova savojna i tlačna čvrstoča vrlo visoke, a ima i odlična estetska svojstva kao što su translucencija, refleksija svjetla, prirodna nepropuzinost i flouorescencija. Čak i u obliku monolitnog nadomjestka, kao u prikazanom slučaju, novi materijali mogu se savršeno uklopiti bez obzira na veće estetske zahtjeve.

Potrebno vrijeme za kompletnu izradu krunice u ordinaciji – od oblikovanja i glodanja do završne obrade – može va- rirati ovisno o materijalu: vrijeme potrebno za proizvodnju u pravilu je od jednog sata (za najjednostavnije materijale) do više od četiri sata (za materijale koji nakon glodanja zahtijevaju cikluse pečenja). Zbog toga, i zbog uobičajene procedure uključujući laboratorija u proizvodnju, mnogi kliničari smatraju da je proizvodnja u ordinaciji gubitak vremena i ma- nje cijene takav postupak jer su mišljenja da doktora odvra- ča od njegovih stvarnih zadaća. No pouzdanost suvremenih CAD-CAM sustava i novih materijala omogućuje kliničari- ma i laboratorijima da donesu novu odluku kako bi osigurali nesmetani rad i kontrolu troškova kad god je to moguće. Ma- terijal za glodanje s dobrim estetskim svojstvima u svakom je slučaju prijeko potreban, bilo da se terapeut odluči za postup- pak koji se u cijelosti obavlja u ordinaciji, bilo da šalje otrisk u laboratorij. Istaknimo da monolitni materijali zapravo ne mogu biti potpuno nepropuzni, što nije nimalo prirodno jer je danas vrlo malo kliničara i pacijenata spremno prihvati ti estetske kompromise (20, 21). Šta stajališta kliničara, postup- ci poliranja nakon mogućih okluzalnih prilagodbi ne bi tre- bali zahtijevati mnogo vremena, ni namjenskih instrumenata i pečenja, što bi značilo dodatne troškove za kliniku i manje vremena za kliničke aktivnosti.
Conclusions

Monolithic, CAD-CAM solutions appear to be a reliable solution for prosthetic rehabilitations even in sectors where esthetics, translucency and reflection of natural light might be of primary importance for patient satisfaction. However, the choice of ideal properties of the selected material still remains of fundamental importance. An ideal monolithic material requires higher skills from the technician, since good fit and control during luting procedures. Even a margin relocation using a glassionomer can be considered in this case, but the depth of the lesion and lack of steps, notches and/or marginal chippings are fundamental for ideal healing times, in order to allow the periodontal ligament to recreate a physiological architecture that normally occurs after at least 21 days of healing process. For this reason, after the surgery but also after the initial preparation for the provisional crown, the authors of this case report decided to wait for 4 weeks (28 days).

The choice of performing a surgical procedure such as the crown lengthening is a simple, strategic step that normally allows creating in a single appointment all the ideal conditions that a complex tooth such as an upper premolar is not offering after extensive tooth decay. In this case, the dentist must respect all ideal healing times, in order to allow the periodontal ligament to recreate a physiological architecture that normally occurs after at least 21 days of healing process. For this reason, after the surgery but also after the initial preparation for the provisional crown, the authors of this case report decided to wait for 4 weeks (28 days).

The patient in this case report represents a stereotype of a highly demanding patient. This normally does not mean that she necessarily needs perfect esthetics, but the resolution of the initial problems (spontaneous pain, also stimulated on chewing, trapping of food in proximal areas, marginal inflammation) is mandatory to achieve the success. Endodontic treatment is the main part of the rehabilitation, because only an appropriate endodontic therapy can solve the pain and permit a solid restoration. However, the position of the restoration, very close to the marginal crest, and the need of performing adhesion for the luting of both composite and ceramic, suggest to clinician to carefully evaluate all the possible complications during the prosthetic procedures, since the wrong positioning of the crown margins could lead to chronological inflammation, bone resorption, pain and definitely to tooth loss. The choice of performing a surgical procedure such as the crown lengthening is a simple, strategic step that normally allows creating in a single appointment all the ideal conditions that a complex tooth such as an upper premolar is not offering after extensive tooth decay. In this case, the dentist must respect all ideal healing times, in order to allow the periodontal ligament to recreate a physiological architecture that normally occurs after at least 21 days of healing process. For this reason, after the surgery but also after the initial preparation for the provisional crown, the authors of this case report decided to wait for 4 weeks (28 days).

The choice of the BOPT technique has been identified as the ideal one for this specific case. First, the mesial carious lesion is close to the bone crest, but also involving the root (Figure 2). In that area, a shoulder preparation requires a huge waste of tooth structure in respect to a vertical preparation. Even in the case the crown lengthening, this sacrifice of sound tissue cannot be limited. A vertical preparation on the other side can be limited to the surface areas, with minimal sacrifice of root tissues, and a good control during luting procedures. Even a margin relocation using a glassionomer can be considered in this case, but the depth of the lesion and good control after crown lengthening suggested to put directly the crown margin on the sound tissue of the root. The CAD design in case of a vertical preparation of teeth normally requires higher skills from the technician, since good fitting and lack of steps, notches and/or marginal chippings are fundamental for the biological integration of the crown under the gingival margin.
Materijal must have the following characteristics, which a dentist must know in order to make an appropriate choice for esthetic and functional rehabilitations: Availability of different shades; Adequate translucency; Ease of processing and milling (little wear on milling burs and machinery); High mechanical strength; Durable in physiologic and pathological oral environment (16,19). Possibility of simple luting with most common adhesive systems or cements; Quick intraoral polishing phase; Availability for the most common chairsides and laboratory milling machines (compatibility).

Only a good mix of these characteristics can determine a clinical success of a prosthetic rehabilitation procedure with monolithic materials and, ultimately, full patient satisfaction.

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