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Restauracije mliječnih zuba cirkonijskim krunicama kod djece s ranim karijesom

Primary Zirconia Crown Restorations for Children with Early Childhood Caries

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Sažetak

Rani dječji karijes (ECC) razarajući je oblik truljenja zuba koji pogađa predškolsku djecu. Obično se pojavljuje na mliječnim maksilarnim sjekutićima dojenčadi i vrlo male djece. Ti su zubi vrlo važni za fizički izgled, pa ako nestane njihova struktura to ne utječe samo na estetiku nego kompromitira i žvakanje, a uzrokuje i teškoće u socijalnoj i psihološkoj prilagodbi djeteta. Estetska restauracija mliječnih sjekutića može se obaviti različitim materijalima, primjerice, gotovim cirkonijskim krunama (ZIRKIZ, HASS Corp; Koreja) koje se adhezivno cementiraju na zube. Te krune estetski i prirodno izgledaju, čvršće su od dentina/cakline, biokompatibilne su i minimalno invazivne. U slučajevima koji slijede opisuje se klinička primjena gotovih primarnih kruna od cirkonija nakon što je zaključeno da je potrebna estetska restauracija mliječnih sjekutića. Nakon kliničke i radiološke procjene uklonjen je karijes i počelo se s preparacijom. Zubi su izmjereni te su odabrane i postavljene odgovarajuće gotove cirkonijske krune. Nakon toga postupka uočena su poboljšanja u psihološkom ponašanju i u prehranbenim navikama pacijenata. Nakon 18-mjesečnih kontrola sve estetske krune bile su neoštećene i nije bilo nikakvih parodontoloških problema. Restauracija ECC-a s opsežnim gubitkom zubne strukture gotovim cirkonijskim krunama praktična je i uspješna metoda. Predstavljena tehnika može se dodati terapijskom izboru liječnika dentalne medicine u slučaju da je nužno liječenje mliječnih sjekutića.

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Ključne riječi

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Uvod

Karijes u ranom djetinjstvu, poznat kao rani dječji karijes ili ECC, prema definiciji Američke akademije za pedijatrijsku stomatologiju (American Academy of Pediatric Dentistry), prisutnost je jednoga ili više karijesom zahvaćenih zuba, ili zubi već nedostaju zbog njegovih posljedica, ali i ispunjene zubne površine kod bilo kojeg djeteta u dobi od 71 mjeseca ili manje (1, 2).

Rani dječji karijes (ECC) složena je bolest koja se pojavljuje na maksilarnim mliječnim zubima mjesec dana nakon nicanja. Širi se vrlo brzo, pa zahvaća i druge zube uzrokujući ozbiljne sociološko-biheviorističke i dentalne probleme kod male djece (3, 4). Najčešći oblik ECC-a su znatno oštećeni prednji mliječni zubi. Nekada je, zbog zahtjevnog postupka restauracije uništenih mliječnih zuba, najčešći zahvat bio ekstrakcija. Prednji mliječni maksilarni zubi bitni su za fizički izgled i njihov gubitak ne utječe samo na estetiku nego otežava žvakanje, izgovor riječi postaje loš, razvijaju se loše navike, pojavljuje se i neuromuskularna neravnoteža, a nastaju i teškoće u socijalnom i psihološkom prilagođavanju djeteta (3). Kliničkim pregledom liječnik otkriva karakterističnu sliku – najčešće su zahvaćeni središnji maksilarni sjekuti-

Introduction

Caries in very young children known as early childhood caries may be defined according to the American Academy of Pediatric Dentistry as “the presence of one or more decayed, missing (due to caries), or filled tooth surfaces in any primary tooth in a child 71 months of age or younger” (1,2).

Early Childhood Caries (ECC) is a complex disease, which involves maxillary primary incisors within a month after eruption and spreads rapidly to involve the other primary teeth, thus causing serious socio - behavioral and dental problem in infants and toddlers (3,4). Most frequent presentation of early childhood caries (ECC) includes severely decayed primary anterior teeth. In the past, the most expedient treatment was to extract the involved teeth because restoration of decayed primary teeth was a challenging job. Primary maxillary anterior teeth dominate the physical appearance, and their structural loss affects not only esthetics but also leads to compromised mastication, poor phonetics, development of aberrant habits, neuromuscular imbalance, and difficulty in social and psychological adjustment of the child (3).

Clinical examination of this condition discloses a distinctive pattern, and the teeth most often involved are the max-

ći, bočni sjekutići te prvi maksilarni i mandibularni mliječni kutnjaci. Najjače su zahvaćeni maksilarni mliječni sjekutići kod kojih karijesne lezije obično zahvaćaju i pulpu. U ekstremnim slučajevima zbog ranog dječjeg karijesa može potpuno nestati kruna zuba. Donedavno je jedina terapija za to bila ekstrakcija (2, 5). Estetski zahtjevi kod teško oštećenih prednjih mliječnih zuba u slučaju ECC-a izazov su u dječjoj dentalnoj medicini. U literaturi se, između ostalih terapijskih mogućnosti, spominju i gotove krune od kompozitnih materijala izrađene ili direktno ili indirektno (6). Suvremeni razvoj restorativnih materijala, tehnike postavljanja, vrste preparacija i adhezivnih postupaka znatno su olakšali obnovu uništenih maksilarnih sjekutića. Tako bi i biološka restauracija mogla biti odgovarajuća alternativa pri restauriranju oštećenih prednjih zuba jer zadovoljava estetske i strukturalne standarde zdravih zuba (2). Pregledom literature u vezi s restauracijom prednjih mliječnih zuba s pomoću preoblikovanih kruna ili korištenjem gotovih oblika za krune, nisu pronađene kliničke studije prema navedenim kriterijima. To upućuje na to da nema znanstvene utemeljenosti koja bi podupirala bilo koju tehniku kojom se kliničari godinama koriste pri rekonstrukciji mliječnih zuba. To što nema dovoljno čvrstih, provjerenih kliničkih podataka ne upućuje na korištenje bilo koje tehnike, nego ističe potrebu za dobro osmišljenim, prospektivnim studijama kako bi se vrednovalo njihovo korištenje (7).

Cirkonijski materijal je zapravo kristalni dioksid cirkonija. Točnije, to je itrijev oksid – djelomice stabilizirani cirkonij (3Y-TZP) s mehaničkim svojstvima vrlo sličnima metalima, a boja mu je nalik na zube (8, 9, 10). Zbog svojstava sličnih nehrđajućem čeliku znatno se može smanjiti debljina materijala za jezgru. Taj izrazito biokompatibilni materijal dobro podnosi klinička naprezanja (8, 11, 12, 13).

Na tržištu se mogu nabaviti gotove krunice od cirkonija za restauraciju mliječnih inciziva i one se neposredno adhezivno cementiraju na zubna tkiva.

Svrha ovog prikaza je opisati kliničku primjenu i rehabilitaciju teško oštećenih maksilarnih prednjih mliječnih zuba kod dvoje četverogodišnje djece s ranim karijesom i to s prije napravljenim estetskim primarnim cirkonijskim krunicama (ZIRKIZ, HASS Corp; Koreja).

Prikaz slučaja

Opisali smo dva slučaja kod kojih su glavni razlog za dolazak liječniku bili teško oštećeni gornji prednji mliječni zubi. Djeca s ECC-om primljena su u ordinaciju na Katedri dječje stomatologije Stomatološkog fakulteta Sveučilišta Marmara u Istanbulu, te smo predstavili primijenjene postupke. Terapija je bila oralna rehabilitacija mliječnih sjekutića s pomoću gotovih primarnih cirkonijskih kruna.

illary central incisors, lateral incisors, and the maxillary and mandibular 1st primary molars. The maxillary primary incisors are the most severely affected with deep carious lesions usually involving the pulp. In extreme cases, early childhood caries can even lead to total loss of the coronal structure. Until very recently, the only treatment option for early childhood caries has been extraction of the affected primary anterior tooth, which resulted in severe coronal destruction (2,5).

The esthetic aspect of severely decayed primary anterior teeth in the case of early childhood caries has been a challenge to pediatric dentist. Among restorative treatment options, prefabricated crown and biological and resin composite restoration either by means of direct or indirect technique are mentioned in the literature (6).

Recent developments in restorative materials, placement techniques, preparation designs, and adhesive protocols have facilitated restoration of decayed maxillary incisors to quite an extent. Therefore, a biological restoration could be an adequate restorative alternative for the decayed anterior teeth, which meets up to the esthetic and structural standards of healthy teeth (2).

In this study, we reviewed the literature concerning the restoration of primary anterior teeth with pre-formed crowns or with the use of crown forms. No clinical studies concerning anterior crowns on primary teeth were identified that met all or even a majority of criteria, indicating that there was little scientific support for any of the techniques which clinicians have utilized for many years to restore primary anterior teeth. While a lack of strong clinical data does not preclude the use of these techniques, it points out the strong need for well designed, prospective clinical studies to validate the use of these techniques (7).

Zirconia is a crystalline dioxide of zirconium. In particular, yttrium-oxide-partially-stabilized zirconia (3Y-TZP) has mechanical properties very similar to those of metals, yet it has a color similar to that of teeth (8, 9, 10). Its mechanical properties, which are similar to those of stainless steel, allow for a substantial reduction in core thickness. Cyclical stresses are also well tolerated by this extremely biocompatible material (8, 11, 12,13).

Ready-made primary Zirconia Crowns are now available for restoration of primary incisors including those that are directly bonded onto the tooth.

The purpose of these case reports was to describe the clinical application and the rehabilitation of severely decayed maxillary primary anterior teeth in 4-year-old early childhood caries children using esthetic ready-made primary zirconia crowns (ZIRKIZ, HASS Corp; Korea).

Case Reports

Here, we describe two cases of a chief complaint of severely decayed primary upper anterior teeth. The children were referred to the Department of Pediatric Dentistry, Dental School, Marmara University, Istanbul. These case reports describe the treatment of children with ECC. The treatment was oral rehabilitation of the primary incisors with ready-made primary zirconia crowns.

Prvi slučaj

Dječak u dobi od četiri godine došao je u pratnji roditelja u Kliniku dentalne medicine zbog prednjih gornjih mliječnih zuba razorenih karijesom. Povijest bolesti nije utjecala na nalaz. Intraoralnim pregledom ustanovljena je potpuna mliječna denticija. Dijete je bilo sramežljivo i povučeno.

Dječaku su zubi 53, 54, 63, 64, 55, 65, 74, 84, 85 i 75 bili zahvaćeni karijesom (slika 1.), a panoramski radiogram otkrio je i zahvaćenost pulpe (slika 2.). Zbog toga je obavljena analiza prehrane i oralna zaštita. Zubi 53, 54, 55, 63, 64, 65, 74 i 84 određeni su za restauraciju kompomerom. Zub 85 izvađen je zbog uznapredovale resorpcije korjenova, a zub 75 bio je tako jako razoren da je nastao periapikalni proces pa je indicirana pulpektomija. Nakon tih postupaka postavljen je kompozitni ispun i obavljena fluoridacija. Zatim su provjereni okluzalni odnosi te su nakon uklanjanja interferencija ispuni dovršeni i polirani *softlex*-vrškom. Roditeljima je preporučeno da dijete dovode na redovite kontrole u Kliniku za dječju stomatologiju svaka četiri mjeseca tijekom godine i pol.

Drugi slučaj

Pregledana je četverogodišnja djevojčica s kutnjacima i prednjim gornjim mliječnim zubima razorenima karijesom. Intraoralnim pregledom ustanovljena je potpuna mliječna denticija. Kod nje su truljenjem bili zahvaćeni zubi 74, 83, 85, 53, 55, 65 i 63 (slika 3.). Na panoramskom radiogramu vidjelo se da je zahvaćena i pulpa (slika 4.). To je bio razlog za analizu prehrane i određivanje oralne zaštite. Zubi 53, 63, 55, 65, 83, 85 pripremljeni su za restauraciju ispunima od kompomera. Prije prvog posjeta Klinici za dentalnu medicinu bila je provedena endodontska terapija na zubima 84 i 75. Provjereni su okluzalni odnosi te su nakon uklanjanja interferencija obavljani završni radovi i poliranje ispuna *softlex*-vrškom. Nakon postavljanja zubi su fluoridirani. Roditeljima pacijentice preporučeno je da ju dovode na redovite kontrole. Njezina konačna prognoza još nije postavljena.

Ovi opisi slučajeva predstavljaju izazovne zadatke u terapiji dvoje četverogodišnje djece s ECC-om i oštećenim maksilarnim sjekutićima s pomoću gotovih primarnih cirkonijevih krunica.

Klinička tehnika

Kako bi se postigli najbolji rezultati, mora se, prije obrade zuba, odabrati odgovarajuća veličina krune. Tako će se osigurati lijepa i prirodna restauracija u skladu s osmijehom djeteta. Nakon kliničke i radiografske procjene, tkiva zahvaćena karijesom uklanjaju se okruglim čeličnim svrdlima pod lokalnom anestezijom.

Vestibularnim i oralnim brušenjem skida se 0,5 do 1,0 mm zubne strukture. Preparacija vestibularne i oralne strane treba se spojiti na tankom incizalnom rubu koji odgovara onom planiranom nakon konačne restauracije. Taj tanki incizalni rub omogućuje da se smanje smetnje između zuba i

Case 1

A 4-year-old boy was brought to the dental clinic complaining of severely decayed primary upper front teeth. Medical history was noncontributory. Intraoral examination revealed a complete set of deciduous dentition which was compromised. The child was shy and withdrawn.

It was observed that teeth number 53, 54, 63, 64, 55, 65, 74, 84, 85, and 75 were affected by dental caries for the boy (Figure 1) and panoramic radiographs revealed pulp involvement (Figure 2). Diet analysis, counseling, and oral prophylaxis were carried out. Teeth number 53, 54, 55, 63, 64, 65, 74 and 84 were indicated for compomer restorations. For number 85, extraction was performed, due to the root resorption. Tooth 75 was severely decayed with periapical abscess and therefore, pulpectomy was indicated. After pulpectomy, composite restoration of number 75 was performed. Fluoride application was performed after temporization. The occlusion was checked and after the removal of any interference, final finishing and polishing of all restorations was performed using *softlex* tips. The patient was advised to come for regular checkups. The child was monitored in the Pediatric Dentistry Clinic at four-month intervals for one and a half year.

Case 2

A four-year-old girl with severely decayed primary molars and decayed upper front teeth was examined. Intraoral examination revealed a complete set of deciduous dentition which was compromised.

It was observed that 74, 83, 85, 53, 55, 65 and 63 were affected by dental caries for the girl (Figure 3). Panoramic radiographs revealed pulp involvement (Figure 4). Diet analysis, counseling, and oral prophylaxis were carried out. Teeth number 53, 63, 55, 65, 83, 85 were indicated for compomer restorations. Endodontic treatments of number 84 and 75 were performed before the first visit. The occlusion was checked and after the removal of any interference, final finishing and polishing of all restorations was performed using *softlex* tips. Fluoride application was performed after temporization. The patient was advised to come for regular checkups. Her condition is still being monitored.

These case reports describe the challenging task of treating two four-year-old early childhood caries children with decayed maxillary incisors with esthetic ready-made primary zirconia crowns.

Clinical Technique

For the best result, it is recommended to select the appropriate crown size prior to tooth preparation. This simple step will help ensure beautiful and natural restorations, consistent with the child's original smile.

After clinical and radiographic evaluations; caries were removed with stainless steel round burs under local anesthesia.

Facial reduction and lingual reduction involves removing 0.5-1.0 mm of tooth structure. The facial and lingual preps should meet in a thin incisal edge corresponding to the planned incisal edge of the final restoration. This thin incisal

unutarnje površine krunice. Provjera okluzije osigurava dovoljno prostora u odnosu na antagoniste. Aproximalno brušenje obavljeno je tako da su stvoreni paralelni mezijalni i distalni obronci koji se protežu milimetar do dva subgingivno do incizalnog ruba preparacije. Iznimno je važno da krunice od cirkonija naliježu pasivno jer se ne mogu kratiti škarama kao tradicionalne čelične krunice (SSC). Potrebno je koristiti se visokoturažnom brusilicom s finim dijamantnim zrnima i krunice stalno dovoljno hladiti jer toplina može uzrokovati mikropukotine u keramičkoj strukturi. Odgovarajuća veličina krunice od cirkonija treba *sjedati* pasivno, mora biti potpuno subgingivna i ne smije gnječiti tkiva desni. Zato što se čvrste cirkonijske krunice NE SAVIJAJU, jače utiskivanje ne pomaže. Nakon toga zubi se operu i očiste ostaci krvi i slina (slike 5. i 6.). Krunice se moraju potpuno napuniti stakloionomernim cementom kako bi se kod cementiranja spriječio nastanak bilo kakvih unutarnjih praznina. Ako se cementiraju krunice ZIRKIZ, preporuka je *smolom modificirati svjetlosno-polimerizirajući cement*. Cementiranje je najvažnije za kasniji lijep osmijeh. Najprije se treba zajedno cementirati središnje sjekutiće, a tek tada lateralne. Tijekom cementiranja potreban je konstantan pritisak prstima. Brisanje viška cementa s labijalne strane omogućit će bolji pregled sprijeda i bolje konačno usklađivanje, što znatno poboljšava konačni estetski rezultat. Oznake se s krunica mogu ukloniti grebanjem ekskavatorom ili poliranjem pastom. Provjerava se i okluzija te, ako se otkrije, uklanjaju se interferencije. Završni radovi i poliranje obavljaju se *softflex*-vrškom (slike 7. i 8.). Nakon postavljanja na redu je topikalna fluoridacija i na kraju se pacijentu preporučuju redovite kontrole – najprije nakon tjedan dana, pa mjesec dana, tri mjeseca i poslije šest mjeseci. Poboljšanje dječje psihe znatno je pridonio estetski rezultat (slike 9. i 10.).

Nakon pola godine kontrolnog praćenja, krunice su pokazale dobru retenciju i dobar estetski rezultat (slike 11. i 12.).

Rasprava

Teško oštećeni mliječni maksilarni sjekutići zbog traume ili karijesa čest su problem u pedijatrijskim ambulantama. Najviše slučajeva otkriva se kod dječaka i djevojčica s *karijesom bočice* (ECC-om) i to kod 50 posto dječje populacije (5,14,15). Kod karijesa rane dječje dobi karakteristično je rano zahvaćanje prednjih maksilarnih zuba (16).

Restauracija mliječnih sjekutića često je težak postupak i zato predstavlja poseban izazov oralnim kirurzima i dječjim stomatolozima (17, 18). Estetska restauracija teško oštećenih prednjih mliječnih zuba dugo je bila izazov dječjim stomatolozima, ne samo zbog materijala i tehnika, nego i zato što se djeca kojima je potrebna ubrajaju u skupinu najmlađih i najtežih pacijenata za suradnju (6).

Osim svega navedenoga ti zubi imaju kratku i usku krunu te je samo mala površina pogodna za adhezivno vezivanje.

edge helps to reduce internal interferences between the tooth and the internal surface of the crown. Occlusion should be checked to insure there is adequate clearance from opposing dentition. Interproximal reduction was carried out and it involved creating parallel mesial and distal walls extending from 1-2 mm subgingivally to the incisal edge of the preparation. It is very important that zirconia crowns fit passively. They are ceramic and cannot be trimmed with scissors like a traditional stainless steel crown (SSC), therefore, it is necessary to use a high-speed, fine diamond with lots of water because excessive heat could cause micro-fractures in the crown's ceramic structure. The appropriate size zirconia crown should fit passively and should be completely subgingival without distorting the gingival tissue. Because they are solid Zirconia and DO NOT flex, pushing harder will not work. After that, the teeth were rinsed and all blood was removed (Figure 5, 6).

Glass ionomer cement should be used to fill the crown completely, to eliminate any internal voids. "Light-cure resin cement" is recommended for cementation of ZIRKIZ crowns. Cementation is the most important step in creating a beautiful smile. First, the central teeth should be cemented together and then the lateral ones. Consistent, firm finger pressure should be applied during cementation. Wiping excess cement from the facial embrasure will allow a clearer facial view and insure a better final alignment, dramatically improving the final esthetic result. Tooth labeling can be scratched off with a spoon or polished off with coarse prophylaxis paste. The occlusion should be checked and after the removal of any interference, final finishing and polishing of all restoration should be performed using softflex tips. (Figure 7, 8). Fluoride application should be carried out after temporization. The patient was advised to come for regular checkups.

After the treatment, clinical controls were performed at first week, first and third month as well as after 6 months and success was achieved. Esthetic results of the restoration significantly improved the child's mental state (Figure 9, 10).

One and a half year later, the crowns demonstrated good retention and esthetic results (Figure 11-12).

Discussion

A problem commonly faced in pediatric clinics is the restoration of primary maxillary incisors severely destroyed by trauma or caries. Most cases are observed among children with nursing bottle caries (Early Childhood Caries) in approximately half the child population (5, 14, 15). In early childhood caries, there is early carious involvement of the maxillary anterior teeth (16).

The restoration of primary incisors is often a difficult procedure that presents a special challenge to dental surgeons and to the pediatric dentist (17,18). The esthetic restoration of severely decayed primary anterior teeth has for a long time been a challenge for the pediatric dentist, not only because of the available materials and techniques, but also the children who require such restorations are usually among the youngest and least manageable group of patients (6).



- Slika 1. Intraoralna fotografija dječaka prije terapije
 Figure 1 Intraoral photograph of the boy before treatment
- Slika 2. Panoramski radiogram dječaka prije terapije
 Figure 2 Panoramic radiographs of the boy before treatment
- Slika 3. Intraoralna fotografija djevojčice prije terapije
 Figure 3 Intraoral photograph of the girl before treatment
- Slika 4. Panoramski radiogram djevojčice prije terapije
 Figure 4 Panoramic radiographs of the girl before treatment
- Slika 5. Zubi dječaka nakon preparacije
 Figure 5 Teeth after preparation for the boy
- Slika 6. Zubi djevojčice nakon preparacije
 Figure 6 Teeth after preparation for the girl
- Slika 7. Postoperativna intraoralna fotografija dječaka
 Figure 7 Postoperative intraoral photograph of the boy
- Slika 8. Postoperativna intraoralna fotografija djevojčice
 Figure 8 Postoperative intraoral photograph of the girl
- Slika 9. Kontrolna fotografija zubi dječaka nakon 6 mjeseci
 Figure 9 After 6 months photograph of the boy
- Slika 10. Kontrolna fotografija zubi djevojčice nakon 6 mjeseci
 Figure 10 After 6 months photograph of the girl
- Slika 11. Kontrolna fotografija zubi dječaka nakon jedne i pol godine
 Figure 11 After One and a half year photograph of the boy
- Slika 12. Kontrolna fotografija zubi djevojčice nakon jedne i pol godine
 Figure 12 After One and a half year photograph of the girl

Pulpna komorica razmjerno je velika, a caklina se teško jetka zbog aprizmatске strukture. Često je cijela zubna kruna destruirana te za adhezivno vezivanje ostaje samo dentin u korijenu. Tako je prije jedino rješenje za zahvaćene zube bila ekstrakcija i nadomještanje protetskim zamjenama (19,20). Tehnika koja omogućuje učinkovitu, trajnu i funkcionalnu restauraciju, a pritom je jednostavna, poboljšala bi suradnju s pacijentima koji dolaze s karijesom na maksilarnim mliječnim zubima. Tako bi se omogućila suradnja djece i smanjila nelagoda povezana s restaurativnim zahvatom (18). Zbog smanjene zubne strukture izravne restauracije uvijek ne zadovoljavaju. Oblik, funkcija i estetika bolje se mogu postići protetskim tehnikama, a razvoj i rast djeteta mogu se pritom poboljšati (17, 21).

No, rezultat je često neuspješan ne samo zbog nedostatka zubne strukture, loše adhezije na mliječnim zubima i ograničenog izbora materijala i tehnika, nego i zbog djece koja se ubrajaju u najtežu skupinu pacijenata kad je riječ o suradnji. Nakon endodontske terapije mliječnih inciziva koriste se različiti restaurativni materijali, poput celuloidnih kapica, čeličnih kruna, metalno-plastičnih kruna, keramičkih ljuskića, polikarbonatnih krunica i krunice od akrilne smole (20). Znanje o specifičnoj čvrstoći, nedostacima i svojstvima svakog materijala omogućuje kliničaru da odabere najbolje za svaku situaciju. Krunice za restauraciju mliječnih sjekutića uključuju one koje se neposredno adhezivno vežu na zube, a to su općenito smolasti materijali i krune koje se cementiraju na zub, među koje su svrstane i neke vrste čeličnih krunica. Zbog premalo kliničkih podataka ne može se tvrditi da je bilo koja vrsta krunice bolja u odnosu na druge u svim okolnostima. To ne umanjuje činjenicu da se liječnici dentalne medicine već godinama uspješno koriste mnogima od tih gotovih kruna. Na izbor utječu sklonosti operatera, estetski zahtjevi roditelja, ponašanje i suradnja djeteta te vlaga i kontrola krvarenja, a na kraju utječu i na konačni rezultat bilo koje odabrane terapijske varijante (21). Pregledom literature ustanovljeno je da postoje određeni dokazi o učinkovitosti i vrijednosti korištenja prednjih mliječnih zuba zbog poboljšanih estetskih rezultata (22). No, nisu pronađena klinička istraživanja o krunicama na prednjim mliječnim zubima koja bi zadovoljavala sve kriterije ili barem većinu, što upućuje na to da nema znanstvene podloge za bilo koju od navedenih tehnika kojima se kliničari koriste već godinama pri restauriranju prednjih mliječnih zuba. Kako se zbog nedostatka dobrih kliničkih podataka ne daje prednost ni jednoj tehnici, potrebna su dobro osmišljena prospektivna istraživanja kako bi se vrjednovala pojedine tehnike (21). Unatrag nekoliko godina razvijena je nova vrsta keramičkih materijala temeljenih na cirkonijskom dioksidu. Itrij – stabilizirani tetragonalni cirkonijski polikristal (Y-TZP) ima jedinstvenu sposobnost za suprotstavljanje propagaciji pukotina, transformira se iz jedne kristalne faze u drugu, te porastom volumena zaustavlja pukotinu i sprječava njezino napredovanje. Taj se materijal može upotrijebiti kod većih restauracija i u području kutnjaka. Ponavljamo – nema dovoljno informacija o kliničkom praćenju restauracija rađenih cirkonijem i o restauracijama s keramikom poduprtom implantatima (23). Na temelju ograničenog broja kratkoročnih istraživanja *in vivo*, cirkonij se či-

In addition to that, these teeth usually have short and narrow crowns, thus only a small surface is available for bonding, and the pulp chamber is relatively large and enamel is inherently difficult to acid etch due to its aprismatic nature. In many cases, destruction of the whole crown causes only dentine to remain in the root for bonding. Therefore, in the past, the only treatment option would have been to extract the affected teeth and replace them with prosthetic replacements (19, 20).

There is a need for a restorative technique that is able to provide efficient, durable and functional restorations, that is simple to perform and which would enhance the management of patients presenting with carious maxillary primary incisors. Such a technique could help to ensure the child's cooperation and reduce the anxiety associated with restorative treatment (18). Because of the reduced coronal structure, direct restorative procedures do not always give satisfactory results. Shape, function and esthetics can be better restored by means of prosthodontic techniques. The child's growth and development may be improved (17, 21).

There is a high rate of failure not only because of absence of tooth structure, poor adhesion of bonding agent to primary teeth, limited availability of materials and techniques, but also the children who require such restorations are among the youngest and least manageable group of patients. After endodontic treatment, there is a variety of esthetic restorative materials available for restoring primary incisors such as celluloid strip crowns, stainless steel crowns, metal plastic crowns, porcelain veneers, polycarbonate crowns and acrylic resin crowns (20).

Knowledge of the specific strengths, weaknesses, and properties of each material will enhance the clinician's ability to make the best choice of selection for each individual situation.

Crowns available for restoration of primary incisors include those that are directly bonded onto the tooth, which are generally a resin material, and those crowns that are luted onto the tooth and are some type of stainless steel crown. However, due to lack of supporting clinical data, none of the crowns can be said to be superior to the others under all circumstances.

Many options exist to repair carious primary incisors, but there are insufficient controlled clinical data to suggest that one type of restoration is superior to another. This does not discard the fact that dentists have been using many of these crowns for years with success. Clinician's preferences, esthetic demands by parents, the child's behavior, as well as moisture and hemorrhage control are all variables which affect the decision and ultimate outcome of whatever restorative treatment is chosen (21).

The review of literature indicated that there is some evidence on the efficacy and value of using anterior primary teeth crowns because of the improved esthetic results. There is an obvious lack of prospective well controlled studies; therefore, further research is needed (22).

No clinical studies concerning anterior crowns on primary teeth were identified that met all or even a majority of criteria, indicating that there was little scientific support for

ni pogodan za pojedinačne krune, fiksne djelomične proteze i kao abatement za implantate, ali uz strogo poštovanje protokola tijekom postupka proizvodnje i postavljanja. Daljnja dugoročna prospektivna istraživanja potrebna su zato da bi se ustanovio najbolji proizvodni postupak za restauracije s cirkonijem (13). U našim prikazima slučajeva opisane su estetske restauracije s pomoću cirkonijskih kruna, a primijenjene su kod dvoje pacijenata s ranim dječjim karijesom na teško oštećenim mliječnim sjekutićima. Određeni stupanj translucencije čini ih pogodnima za estetski zahtjevne kliničke slučajeve, kao što su restauracije prednjih maksilarnih zuba. Dobar omjer čvrstoće, točnosti i translucencije omogućuje kod restauracija s cirkonijem prilagodbu različitim kliničkim situacijama (24). Nema mnogo objavljenih podataka o usporedbi dugoročnih kliničkih rezultata kad je riječ o različitim vrstama kruna temeljenih na cirkoniju, posebice za pacijente koji su posjećivali privatne ordinacije dentalne medicine. Doista, većina istraživanja laboratorijski je kontrolirana, a većina kliničkih procjena obavljena je na malom broju pacijenata (12). Cirkonij je uspješno preživio godinu i pol ako se uzme u obzir tehnička, biološka i estetska perspektiva.

Na kraju – smatramo da je rješavanje EEC-a s opsežnim gubitkom strukture zuba s pomoću cirkonijskih kruna praktično i uspješno. Opisani terapijski postupci jednostavni su i učinkoviti te predstavljaju dobru alternativu za rehabilitaciju jako destruiranih ili frakturiranih prednjih mliječnih zuba. Tehnika s cirkonijskim krunama pokazala je dobre rezultate i dječjoj je stomatologiji dala dodatnu terapijsku mogućnost. Njome se dječji stomatolozi mogu koristiti kao terapijskom mogućnošću u slučaju restauriranja mliječnih inciziva. Kod odabira materijala treba usporediti troškove i tek tada odabrati alternativne metode. Očekuje se da bi gotove cirkonijske krune uskoro mogle zamijeniti tradicionalnu izradu zahvaljujući svojim prednostima, uključujući vrijeme izrade, estetiku, poboljšanu mikrostrukturu i mnogo jeftiniju opremu.

any of the techniques which clinicians have utilized for many years to restore primary anterior teeth. While a lack of strong clinical data does not preclude the use of these techniques, it points out the strong need for well designed, prospective clinical studies to validate the use of these techniques (21).

More recently, a new type of ceramic material, based on zirconium dioxide, has been developed. Ytria-stabilized tetragonal zirconia polycrystal, Y-TZP, has a unique ability to resist crack propagation by being able to transform from one crystalline phase to another, and the resultant volume increase stops the crack and prevents it from propagating. This material has the potential to be used for larger restorations and in the molar area. Again there is a lack of information. However, clinical follow-up of zirconia-based restorations is available, especially those long-term, whereas information on all-ceramic restorations supported by implants is lacking (23).

Based on the limited number of short-term *in vivo* studies, zirconia appears to be suitable for the fabrication of single crowns, and fixed partial dentures and implant abutments provided that strict protocols during the manufacturing and delivery process are adhered to. Further long-term prospective studies are necessary to establish the best manufacturing process for zirconia-based restorations (13).

These case reports document the esthetic ready-made primary zirconia crown restorations of severely decayed primary incisors in two patients with early childhood caries.

A moderate level of translucency makes it suitable for esthetically demanding clinical cases, such as restoring maxillary anterior teeth. A good balance of strength, precision, and translucency allows zirconia-based restorations to accommodate a variety of clinical situations (24).

However, there have not been significant amount of data published regarding a comparison of long-term clinical results from the use of different kinds of zirconia-based crowns, particularly for patients who have attended private dental practices. Indeed, most published studies have been laboratory-controlled investigations, and the majority of these clinical evaluations have reported data on small numbers of patients (12).

At one and a half year, zirconia lasted with technical, biological and esthetical success.

In conclusion, we suggest that in ECC with excessive tooth structure loss, using zirconia crowns would be practical and successful. The treatment described in the case report is simple and effective and represents a promising alternative for rehabilitation of severely decayed or fractured primary anterior teeth. This technique of zirconia crowns has shown promising results and has presented the pediatric dental world an additional treatment option. The technique presented here can be added as a treatment option to restore primary incisors for pediatric dentists. When choosing a material, costs should be thoroughly compared with other alternative methods. It is expected that in the near future, prefabricated zirconia crowns could be promising replacements for conventional processing methods due to their unparalleled advantages, including working time, esthetics, improved microstructure and much less expensive equipment.

Zaključak

Roditelji djece, ali i liječnici dentalne medicine, tijekom restauracije traže estetske tehnike i rješenja s krunicama. Danas se upotrebljavaju nove i estetske gotove dječje krunice od cirkonija. To je novi pristup u vraćanju prirodnog dječjeg osmijeha uz minimalno invazivnu tehniku. Krunice od cirkonija vrlo estetski i prirodno izgledaju, a pacijent na stomatološkom stolcu ne provodi previše vremena.

Conclusion

Parents of children in need of restorative dental work as well as dental professionals are seeking more esthetic crown options. Zirconia crowns are new, unique, esthetic pediatric dental crowns available on the market today. Zirconia crown has created a new approach to restoring the natural appearance of a child's smile with a minimally invasive technique. Zirconia crowns have superior esthetics and natural appearance with short chair time.

Abstract

Objective: Early childhood caries (ECC) is a particularly destructive form of tooth decay that affects preschool children. It usually involves a distinctive pattern of caries which severely degrades the primary maxillary incisors of infants and very young children. Primary maxillary anterior teeth dominate the physical appearance, and their structural loss affects not only esthetics but also leads to compromised mastication, and difficulty in social and psychological adjustment of the child. A variety of esthetic restorative materials are available for restoring primary incisors. Ready-made primary Zirconia Crowns (ZIRKIZ, HASS Corp; Korea) are now available for restoration of primary incisors including those that are directly bonded onto the tooth. ZIRKIZ Crowns are esthetically pleasing, stronger than dentin/enamel and offer some advantages such as natural appearance, biocompatibility and are minimally invasive. This case report describes the clinical application of primary incisors restoration with esthetic ready-made primary zirconia crowns. After clinical and radiographic evaluations; caries was removed and tooth preparation was completed. Ready-made zirconia crown was measured and placed. Improvements in the patient's psychological behavior and improved eating habits were observed. At the one and half year recall, all esthetic crowns were intact, without periodontal problems. ECC with excessive tooth structure loss can be successfully restored by zirconia crowns. The technique presented here can be added as a treatment option to restore primary incisors for pediatric dentists.

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Key words

Tooth, Deciduous; Dental Caries; Child, Preschool; Incisor; Crowns; zirconium oxide

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