CASE REPORT
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Multidisciplinary approach in treatment of spacing: orthodontic treatment and partial ve-neers using the injectable composite resin technique

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SUMMARY

Introduction Patients with orthodontic diagnosis of spacing most often require a multidisciplinary approach, which includes orthodontic and following restorative treatment to enhance the esthetic outcome. The aim of this case report is to present management of spacing in the anterior region by orthodontic treatment followed by partial veneers using the injectable composite resin technique.

Case report In this case, leveling and alignment of dental arches and stable occlusion was achieved during orthodontic treatment, with the correction of upper and lower incisor inclination and closing the diastemas. Intraoral and extraoral esthetic parameters were evaluated on the photographs, and partial veneers on lateral incisors and canines were designed for the wax-up model. In the injectable composite resin technique, the silicone index was used to transfer the wax-up to composite restorations. The highly filled injectable composite resin was injected through the silicone index and light-cured. The restoration required only gentle polishing due to the great precision of the index.

Discussion Post-orthodontic recontouring in the anterior region is mostly done by direct composite restorations because they are cost-effective, minimally invasive, and the procedure is relatively simple. The injectable resin composite technique can be a solution for the same indication since it is less technique sensitive and gives predictable and great esthetic results, mostly without tooth preparation.

Conclusion Management of anterior spacing in adult patients requires a comprehensive approach for optimal esthetic and functional results. In this case, orthodontic treatment was followed by partial veneers on lateral incisors and canines, using the injectable composite resin technique as a simple and predictable solution for minor restorative interventions to solve morphological tooth abnormalities in the esthetic smile zone.

Keywords: spacing; orthodontic treatment; composite; partial veneers; injectable technique

INTRODUCTION

Anterior spacing and tooth size discrepancy is one of the most common features in adult dentition. Meeting patient's demands and expectations is the first step in deciding which treatment option is the best for optimal esthetic results. Orthodontics alone can give a great esthetic improvement, but multidisciplinary treatment is often needed for excellent treatment outcomes. Most often, orthodontic treatment is followed by restorative treatment [1, 2]. Direct restorations are done in one session, applying layers of composite directly to the tooth surface. Indirect restorations are preferred in complex cases, and they require collaboration with dental technicians [3]. Direct restorations are practical and have several advantages, such as saving the tooth structure; reversibility of procedure, lower cost to the patient, and the material can be added or removed easily, if necessary [1, 4, 5].

The injectable resin composite technique is a predictable dental procedure where a diagnostic wax-up is translated into composite restorations. It is an indirect/ direct technique that can be used to repair fractured teeth and restorations, provisional restorations, veneers, resurfacing occlusal wear on posterior composite restorations, and also in primary dentition for teeth with multiple caries or fractures [6, 7]. This technique is minimally invasive and relatively inexpensive compared to conventional ceramic veneers procedure, and tooth preparation is mostly not required [8].

The aim of this case report is to present management of spacing in the anterior region by orthodontic treatment followed by partial veneers using the injectable composite resin technique.

CASE REPORT

A 32 years old male patient presented to the dental office complaining about his smile's esthetic appearance. He did not like the misalignment of the anterior teeth as well as the spaces between them.

The main cause of spacing in his case was a discrepancy of tooth size and arch length. In his case, the labial frenulum was not prominent. In occlusion, molar and canine relation

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Figure 1. Initial clinical situation – class I canine and molar relationship and spacing in anterior region of dental arch
Slika 1. Početna situacija – odnos I klase po Englu na očnjacima i molarima i rastresitost u prednjoj regiji zubnog niza

Figure 2. Esthetic fixed appliances in upper and lower dental arch
Slika 2. Estetski fiksni aparati u gornjem i donjem zubnom nizu

was class I on both sides. Cephalometric analysis did not show skeletal discrepancies, and both upper and lower incisors were proclined. Orthodontic treatment aimed to level and align dental arches, correct the upper and lower incisors' position, close the diastemas in the upper and lower dental arch, and achieve good occlusion. Since esthetics was very important for the patient even during the orthodontic treatment, ceramic braces (Radiance, American orthodontics, Roth prescription, slot 22) were chosen. Standard arch wire protocols were followed and power chains were used for closing the spaces between the teeth. (Figures 1, 2).

After 13 months of orthodontic treatment, all diastemas were closed and a stable static and functional occlusion achieved. Although all the spaces were closed in gingival areas of teeth, black spaces between upper lateral incisors and canines were visible in incisal parts. Recontouring of lateral incisors and canines was necessary to enhance the esthetic outcome (Figure 3). Direct composite buildups could be a solution in minimally invasive and non invasive cases, since they are esthetic, functional, and biologically sound treatment options for closing diastemas with clinically promising survival rates [1]. After explaining possible treatment options, the patient decided to take a restorative treatment based on the injectable resin composite technique because it offers esthetic and predictable results and no dental tissues preparation. For this technique, an adequate design of the restoration is needed. Intraoral and extraoral photos of the patient were taken with a digital camera (D3400, Nikon corporation) and esthetic parameters evaluated. The future shape of lateral incisors

Figure 3. Clinical situation after orthodontic treatment- stable occlusion, diastemas closed; spaces present between upper lateral incisors and canines (only incisal parts) on both sides due to irregularities of the tooth shape
Slika 3. Klinička situacija posle ortodontske terapije – stabilna okluzija I klase po Englu, zatvorene dijasteme; prisutni su prostori između gornjih lateralnih sekutića sa obe strane (samo u incizalnom delu) zbog nepravilnog oblika ovih zuba.

Figure 4. Future shape of lateral incisors and canines designed; future partial veneers wax-up
Slika 4. Dizajn budućeg oblika gornjih lateralnih sekutića i očnjaka; izgled budućih delimičnih faseta u vosku

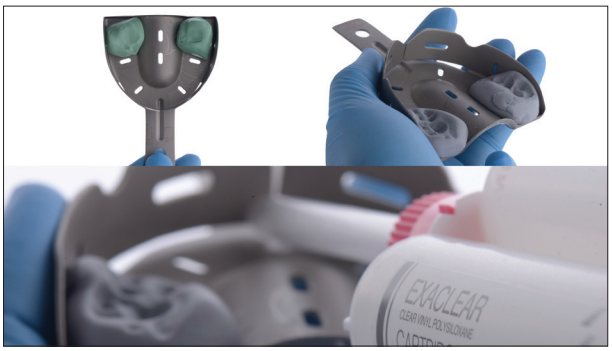

Figure 5. Preparation of impression tray using silicone stops to save the same thickness of the material
Slika 5. Priprema kašike za otisnu masu uz pomoć silikonskih stopera koji obezbeđuju istu debljinu materijala

and canines were designed in Keynote software (Apple Corporation). According to this design, partial veneers wax-up was made (Figure 4) Two veneers were planned on distal incisal surfaces of upper lateral incisors and two on mesial surfaces of canines to enhance the smile esthetics.

Based on the wax-up, a transparent silicone index was made using a clear polyvinyl siloxane (Exaclear,GC Corp.,Tokyo, Japan). Before making the silicone index, in order to hydrate, the plaster model was soaked in the cold water and left in for 5 minutes. Impression tray was

Figure 6. Silicone index with incisal perforations for composite injection
Slika 6. Silikonski ključ sa perforacijama u incizalnom delu koje će služiti za injektiranje kompozita

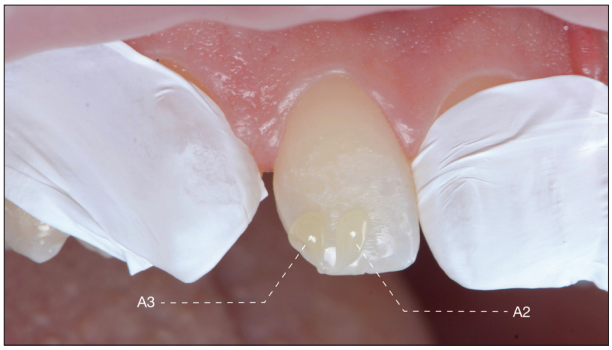

Figure 7. Determining the colour for the restoration using small amounts of composite; A2 chosen for the restoration
Slika 7. Određivanje boje budućih nadoknada korišćenjem male količine kompozita; A2 izabrana za buduće nadoknade

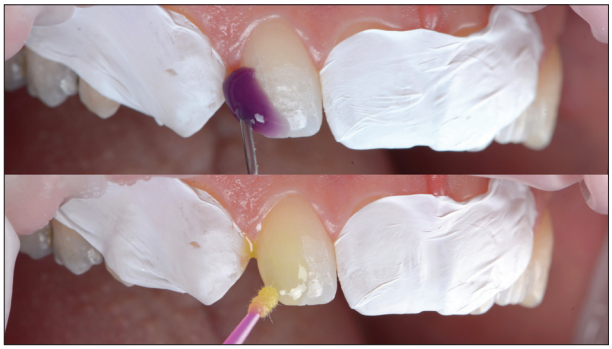

Figure 8. Phosphoric acid etching and bonding procedure
Slika 8. Priprema gleđi ortofosfornom kiselinom i nanošenje bonda

Figure 9. Injection of highly filled flowable composite through perforations on silicone index
Slika 9. Injektiranje tečnog kompozita kroz perforacije na silikonskom ključu

Figure 10. Final clinical situation
Slika 10. Klinička situacija na kraju procedure

Figure 11. Patient's smile after orthodontic and restorative procedure
Slika 11. Osmeh pacijenta posle završene ortodontske i restaurativne procedure

prepared using stoppers made of C - silicone (Zeta plus putty, Zhermack) to save the same silicone thickness in every part of the silicone key (Figure 5). Small perforations through the silicone index were made using the syringe of flowable resin composite (Figure 6). The perforations were made to the distal parts on the incisal edges of lateral incisors and canines' mesial parts. The material chosen for this intervention was a highly filled flowable resin composite (G-ænial Universal Injectable, GC corporation). The teeth were cleaned using fluoride-free polishing paste. Choosing the right color was done at the very beginning of the procedure, using a small amount of the material (composite buds) on the lateral incisors and canines, which were then light-cured. Shade A2 was selected for the procedure (Figure 7). The adjacent teeth were isolated using Teflon tape. One lateral incisor's polished enamel surface was etched with 37% phosphoric acid (37.5% Phosphoric Acid Gel, Kerr) for 40s, rinsed with water and air-dried. The universal adhesive (GC G-Premio Bond, GC Corporation) was applied to pre-etched surfaces with a micro brush for 10 sec, then air blown for 5 sec, and polymerized using a LED light-curing unit (3M Elipar™ DeepCure-S LED Curing Light) for 10 sec, according to manufacturers' instructions (Figure 8). The silicone index was positioned carefully and flowable resin composite injected through the perforation made on the incisal part of the silicone index for right lateral incisor (Figure 9). The restoration was light-cured for 40 sec from labial, occlusal and palatal direction. The

silicone index was removed, and the rest of the material was cut off with a scalpel. The procedure was repeated for right canine, and left lateral incisor and canine, one tooth at a time, protecting the finished restorations with the Teflon tape. Due to incredible precision of silicone index, the restorations required only simple and gentle polishing and finishing with finishing discs and silicone points. Proximal surfaces were smoothened with polishing strips. After polishing the restorations, new thermoplastic retainers were made to prevent tooth alignment changes after orthodontic treatment (Figures 10, 11).

DISCUSSION

Management of spacing in adults often requires a multidisciplinary approach for optimal results. Tooth alignment and stable static and functional occlusion can be achieved with orthodontic treatment, but the tooth shape abnormalities can be solved with indirect restorations (ceramic or composite) or by direct composite restorations.

Ceramics has always been a material of choice for anterior restorations because it is biocompatible, chemically stable, and effective in reproducing the tooth's natural translucency and structure. On the other hand, ceramic veneers require precise preparation since the preparation, among other causes, can be the reason for veneer fracture [3].

The injectable technique is relatively simple and gives a predictable outcome. Compared to direct composite restorations, this technique's main advantage is that it is less challenging and time-consuming. The injectable technique doesn't require preparation, which is very important in preserving sound dental tissues, especially in young patients [6–10]. In our case, the material used was G-aenial universal Injectable (GC Corporation), a highly filled injectable composite resin with improved mechanical properties and esthetics. The same material was used in the report of Hosaka et al. [10], whereas a group of authors in another study [9] used different, but also a highly filled flowable resin composite, G-aenial Universal Flo (GC Corporation).

The clinical effectiveness of these highly filled flowable materials was similar to paste-type composite in 36 months follow-up, in posterior restoration [11]. The study of Lai et al., who evaluated the surface gloss, roughness, and colour change of six different flowable composites, found that G-aenial universal Flo, termed as universal injectable composite by manufacturer, showed better surface properties after tooth abrasion than other composites tested [12].

CONCLUSION

Management of anterior spacing, as one of the most common dental features in adult patients, requires a comprehensive treatment for optimal esthetic and functional results. In the presented case, orthodontic treatment was followed by partial veneers on lateral incisors and canines, using the injectable composite resin technique as a simple and predictable solution for minor restorative interventions in the esthetic smile zone.

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Multidisciplinarni pristup u terapiji rastresitosti: ortodontska terapija i delimične fasete tehnikom injektiranja kompozita

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KRATAK SADRŽAJ

Uvod Kod pacijenata sa ortodontskom dijagnozom rastresitosti u zubnom nizu najčešće je potreban multidisciplinarni pristup, koji podrazumeva ortodontsku terapiju i posle nje restaurativnu proceduru kako bi se poboljšali estetski rezultati.

Cilj ovog rada bio je da se predstavi slučaj uspešnog rešavanja rastresitosti u prednjoj regiji zubnog niza uz pomoć ortodontske terapije i delimičnih faseta izrađenih tehnikom injektiranja kompozita.

Prikaz slučaja U ovom slučaju, ortodontskom terapijom postignuta je nivelacija zubnih nizova i stabilna okluzija, kao i korekcija inklinacije gornjih i donjih sekutića i zatvaranje dijastema. Nakon toga, analizirani su intraoralni i ekstraoralni parametri na fotografijama pacijenta, i dizajniran izgled delimičnih faseta u vosku na lateralnim sekutićima i očnjacima. U tehnici injektiranja kompozita koja je korišćena za izradu delimičnih faseta silikonski ključ poslužio je za prenošenje izgleda faseta u vosku u kompozitne ispune. Zatim je kroz perforacije na silikonskom ključu ubrizgan tečni kompozit poboljšanih estetskih i mehaničkih karakteristika i svetlosno polimerizovan. Zahvaljujući velikoj preciznosti silikonskog ključa, bilo je potrebno samo blago ispolirati ispune.

Diskusija Preoblikovanje zuba posle ortodontske terapije najčešće se radi metodom direktnog slojevanja kompozita jer procedura nije skupa, minimalno je invazivna i relativno je jednostavna. Tehnika injektiranja kompozita može biti rešenje za istu indikaciju jer tehnika manje zavisi od angažovanja terapeuta, i daje predvidive i dobre estetske rezultate, najčešće bez preparacije zubnih tkiva.

Zaključak Rešavanje rastresitosti u prednjoj regiji zubnih nizova kod odraslih pacijenata zahteva složen terapijski pristup za optimalne estetske i funkcionalne rezultate. U ovom slučaju ortodontska terapija bila je praćena izradom delimičnih faseta tehnikom injektiranja kompozita, kao jednostavnom procedurom za minimalne restaurativne intervencije kako bi se poboljšale nepravilnosti morfologije zuba u estetskoj zoni osmeha.

Ključne reči: rastresitost; kompozit; delimične fasete; tehnika injektiranja kompozita

UVOD

Rastresitost u prednjoj regiji zubnog niza i neusklađenost u veličini zuba i alveolarnog grebena predstavljaju veoma čestu pojavu kod odraslih pacijenata. Procena pacijentovih zahteva i očekivanja je prvi korak u odlučivanju koji je metod lečenja najbolji za postizanje optimalnih estetskih rezultata. Sama ortodontska terapija može dati značajna estetska poboljšanja, ali često je neophodan multidisciplinarni pristup za bolji konačan ishod terapije. Nakon ortodontske terapije najčešće je indikovana neka od restaurativnih procedura [1, 2]. Direktne restauracije se izvode u jednoj poseti, nanošenjem slojeva kompozita direktno na površinu zuba. Indirektne restauracije su poželjne kod složenijih slučajeva i zahtevaju saradnju sa zubnom laboratorijom [3]. Direktne restauracije su praktične i imaju nekoliko prednosti, kao što su minimalno uklanjanje zubnog tkiva, reverzibilnost postupka, niže cene intervencije, kao i to da se, ukoliko je potrebno, materijal može jednostavno dodati ili ukloniti [1, 4, 5].

Tehnika injektiranja kompozita je predvidiva stomatološka procedura gde se dijagnostički voštani model prevodi u kompozitne nadoknade uz pomoć silikonskog ključa. Predstavlja indirektno/direktnu tehniku koja se može koristiti za restauraciju karijesom destruisanih ili frakturiranih zuba, za izradu privremenih nadoknada i faseta, obnavljanje okluzalnih površina na bočnim zubima, kao i za mlečne zube sa višestrukim karijesima ili prelomima [6, 7]. Predstavlja minimalno invazivnu tehniku, relativno jeftinu u poređenju sa postupkom izrade keramičkih faseta, u kojoj preparacija zuba najčešće nije potrebna [8].

Cilj ovog prikaza slučaja je da predstavi rešavanje rastresitosti u prednjoj regiji zubnog niza ortodontskom terapijom, praćenom izradom delimičnih faseta, tehnikom injektiranja kompozita.

PRIKAZ SLUČAJA

Pacijent starosti 32 godine, muškog pola, dolazi u stomatološku ordinaciju nezadovoljan estetikom svog osmeha, odnosno izgledom i rasporedom zuba, kao i razmacima između njih.

Glavni razlog postojanja dijastema u ovom slučaju bila je neusklađenost veličine zuba i dužine alveolarnog grebena. U njegovom slučaju, labijalni frenulum nije bio izražen. U okluziji, odnos očnjaka i molara bio je klasa I po Englu, i na levoj i desnoj strani (Slika 1). Kefalometrijska analiza nije pokazala veće skeletne diskrepance, a gornji i donji sekutići bili su proklinirani. Cilj ortodontske terapije bio je iznivelisati zube u gornjem i donjem zubnom nizu, ispraviti položaj gornjih i donjih sekutića, zatvoriti dijasteme u gornjem i donjem zubnom luku i postići dobru okluziju. Budući da je estetika bila vrlo važna za pacijenta čak i tokom ortodontske terapije, odabrane su keramičke bravice (Radiance, American Orthodontics, preskripcija Roth, slot 22). Praćeni su standardni protokoli u nivelaciji uz pomoć ortodontskih lukova, a za zatvaranje dijastema korišćeni su gumeni lanci (Slika 2).

Nakon 13 meseci ortodontske terapije, sve dijasteme su bile zatvorene i postignuta je stabilna statička i funkcionalna okluzija. Iako su svi prostori bili zatvoreni u gingivalnim delovima krunica zuba, u incizalnim delovima su bili vidljivi crni prostori između gornjih lateralnih sekutića i očnjaka. Bilo je indikovano preoblikovanje lateralnih sekutića i očnjaka kako bi se poboljšao estetski ishod (Slika 3).

Direktno slojevanje kompozita moglo bi biti rešenje kod minimalno invazivnih i neinvazivnih procedura, budući da se njima dobijaju dobri estetski i funkcionalni rezultati pri zatvaranju dijastema, sa klinički dobrim stopama trajanja ispuna [1].

Za injekcionu tehniku potreban je odgovarajući dizajn restauracije. Intraoralne i ekstraoralne fotografije pacijenta napravljene su digitalnim fotoaparatom (D3400, Nikon corporation) i na njima su analizirani estetski parametri. Budući oblik lateralnih sekutića i očnjaka dizajniran je u softveru Keynote (Apple Corporation) (Slika 4). Prema ovom dizajnu napravljen je voštani model u zubnoj laboratoriji. Planirane su dve delimične fasete na distalnim incizalnim površinama gornjih lateralnih sekutića i dve na mezijalnim površinama očnjaka.

Prema dizajnu voštanog modela napravljen je silikonski ključ od prozirnog polivinil-siloksana (Exaclear, GC Corporation, Tokio, Japan). Pre izrade silikonskog ključa, u cilju hidratacije, gipsani model je potopljen u hladnu vodu i ostavljen pet minuta. Kašika za otisak je pripremljena pomoću stopera izrađenih od c-silikona (Zetaplus putty, Zhermack) kako bi se ostvarila jednaka debljina silikona u svakom delu silikonskog ključa (Slika 5). Uz pomoć kanile kojom će biti ubrizgan kompozit napravljene su male perforacije kroz silikonski ključ (Slika 6). Perforacije su napravljene na distalnim delovima incizalnih rubova lateralnih sekutića i mezijalnih delova očnjaka.

Materijal izbora za ovu intervenciju bio je tečni kompozit (G-ænial Universal Injectable, GC corporation). Zubi su očišćeni pastom za poliranje bez fluorida. Odabir boje kompozita obavljen je na samom početku intervencije, korišćenjem male količine materijala polimerizovane lampom na lateralnim sekutićima i očnjacima. Odabrana je boja A2 (Slika 7). Susedni zubi izolovani su pomoću teflon trake. Gleđ zuba predviđenog za restauraciju tretirana je 37,5% ortofosfornom kiselinom (37,5% gel ortofosforne kiseline, Kerr) u trajanju od 40 s, isprana vodom i posušena vazduhom iz pustera. Univerzalni adheziv (GC G-Premio Bond, GC Corporation) nanet je na prethodno tretiranu površinu gleđi aplikatorom za bond u trajanju od 10 s, zatim je vazduhom iz pustera posušen maksimalnom snagom u trajanju od 5 s, i polimerizovan pomoću LED lampe za polimerizaciju (3M Elipar™ DeepCure-S LED Curing Light) u trajanju od 10 s, prema uputstvu proizvođača (Slika 8). Zatim je pažljivo postavljen silikonski ključ i kroz perforaciju na incizalnom delu silikonskog ključa ubrizgan tečni kompozit G-ænial Universal Injectable nijanse A2 (Slika 9). Restauracija je polimerizovana u trajanju od 40 s sa labijalne i okluzalne strane. Nakon uklanjanja silikonskog ključa ostatak materijala uklonjen je skalpelom. Postupak je ponovljen za desni očnjak i levi lateralni sekutić i očnjak, jedan po jedan zub, štiteći gotove ispune i susedne zube teflon trakom. Zahvaljujući velikoj preciznosti silikonskog ključa, restauracije je bilo dovoljno jednostavno i nežno ispolirati diskovima i silikonskim polirerima. Aproksimalne površine ispolirane su trakama za poliranje. Posle poliranja restauracije napravljene su nove retencionalne folije za pacijenta, da bi se sprečila pomeranja zuba posle ortodontske terapije (slike 10 i 11).

DISKUSIJA

Rešavanje rastresitosti zubnih nizova kod odraslih pacijenata često zahteva multidisciplinarni pristup za postizanje optimalnih rezultata. Nivelacija zuba i stabilna statička i funkcionalna okluzija postignute su ortodontskom terapijom, dok se anomalije oblika zuba mogu rešiti indirektnim restauracijama (keramičkim ili kompozitnim) ili direktnim kompozitnim restauracijama.

Keramika je uvek bila materijal izbora za nadoknade u prednjoj regiji zubnog niza jer je biokompatibilna, hemijski stabilna i efikasna u reprodukciji prirodne translucentnosti strukture zuba. S druge strane, keramičke fasete zahtevaju preciznu preparaciju, jer preparacija, između ostalih uzroka, može biti razlog loma nadoknada [3].

Tehnika injektiranja kompozita je relativno jednostavna i daje predvidiv ishod. U poređenju sa direktnim kompozitnim restauracijama, glavna prednost ove tehnike je to što je manje izazovna u smislu angažovanja terapeuta i kraće traje. Tehnika injektiranja kompozita najčešće ne zahteva preparaciju zubnih tkiva, što je vrlo važno u kontekstu očuvanja zdravih zubnih tkiva, posebno kod mlađih pacijenata [6–10]. U ovom slučaju je korišćen G-aenial Universal Injectable, univerzalni restaurativni kompozit visoke čvrstoće sa poboljšanim mehaničkim svojstvima i estetikom. Isti materijal korišćen je u studiji Hosaka et al. [10] , dok je grupa autora u drugoj studiji [9] koristila drugi tečni kompozit G-aenial Universal Flo (GC Corporation). Klinička efikasnost ovih tečnih kompozita pokazala se sličnom efikasnosti pastastih kompozita u studiji koja je pratila efikasnost kod ispuna u bočnoj regiji, u trajanju od 36 meseci [11]. U studiji Lai i saradnika, koji su procenjivali sjaj površine, hrapavost i promenu boje šest različitih tečnih kompozita, G-aenial universal Flo pokazao je bolja površinska svojstva posle abrazije zuba od ostalih testiranih kompozita [12].

ZAKLJUČAK

Rešavanje rastresitosti u zubnom nizu kod odraslih pacijenata zahteva složen tretman za postizanje optimalnih estetskih i funkcionalnih rezultata. U ovom slučaju ortodontska terapija je bila praćena izradom delimičnih faseta na lateralnim sekutićima i očnjacima, korišćenjem tehnike injektiranja kompozita kao jednostavnog i predvidivog rešenja za manje restaurativne procedure u estetskoj zoni osmeha.