

Soft Tissue Management at Delayed Implant Loading in the Aesthetic Zone – A Case Report

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SUMMARY

Emergence profile of implant-supported crowns is defined by the characteristics of supracrestal connective tissue (SCT), located between the implant platform and cervical soft tissue margin. This paper reflects the soft tissue contour management of implant-supported screw-retained crowns and the transfer of emergence profile using an indirectly customized impression coping.

A 27-year-old male was referred for endosseous implant placement (Straumann BLT Ø 4.1 mm × 12 mm) in a region of a maxillary right central and lateral incisor. Teeth were extracted due to a cystic formation in the mentioned region. Following the delayed implant loading protocol, implants were exposed, and provisional crowns were fabricated to support marginal mucosa and papillae and to mimic the contralateral site. During the three months of temporization, three-dimensional peri-implant soft tissue changes were validated, and temporary crowns were re-contoured every two weeks to obtain dynamic compression. When adequate soft tissue architecture was achieved, the impression for definitive crowns was taken using customized transfer technique to be able to register the emergence profile of provisional crowns. This case report described a soft tissue management technique, where remodeling the provisional restoration allowed soft tissue to be reshaped. Individual transfer impression technique provides an accurately captured emergence profile of the soft tissue contours around implants in the aesthetic zone. This technique enables contouring of the transmucosal part of the definitive restoration according to the results obtained by individual dynamic compression, which leads to healthy soft tissue contours as well as satisfactory aesthetic results.

Keywords: supracrestal connective tissue; soft tissue management; screw-retained crowns; aesthetic zone; customized impression coping

INTRODUCTION

Besides the desired design and morphology of implant-supported crowns, soft tissue architecture plays a crucial role in biological and overall aesthetic outcomes [1]. After achieving osseointegration with delayed implant loading protocol, the final steps of remodeling the soft tissue still remain challenging. The cylindrical shape of an implant or a prefabricated healing abutment is not compatible with the gingival contour of natural teeth. Thus, additional surgery procedures are often required to obtain the desired aesthetic outcome. However, if the correct 3D implant position is provided, with an adequate thickness of the supracrestal connective tissue it is possible to create the desired emergence profile using non-invasive restorative procedures [2].

In order to establish an ideal emergence profile a vertical dimension of a minimum of 3 mm of supracrestal connective tissue is required [3]. Supracrestal connective tissue around implant differs from the gingival tissue around natural teeth primarily because of reduced vascularisation and parallelly oriented fibers of the connective peri-implant tissue. Moreover, increased permeability in comparison to the junctional epithelium of natural teeth leads to higher susceptibility to infection. Those conditions could result in mucositis and periimplantitis [4, 5]. By guided conditioning, i.e. using dynamic compression

technique in peri-implant region it is possible to obtain optimal conditions for oral hygiene [6]. From the prosthodontic point, the final goal is to recreate the lost contours of the natural tooth [7, 8]. Studies show different approaches and treatment options [5, 6]. The transfer of the emergence profile using an indirectly fabricated modified impression post while focusing on the management of the gingival framework at the healed site of implant placement was the preferred method in this case report.

CASE REPORT

A 27-year-old patient visited the Department of Oral Surgery, University of Belgrade with missing anterior teeth 12 and 11. Teeth were extracted due to a cystic formation in the mentioned region. After proper treatment planning, endo-osseous implants (Straumann BLT Ø 4.1 mm × 12 mm) were placed in the position of teeth 12 and 11, using a bone xenograft (Geistlich Bio-Oss), and according to the restoratively driven implant placement. Following the delayed implant loading protocol, implants were exposed four months post-implantation (Figure 1).

The open tray technique was used to make a definitive impression for provisional crowns. The copings for open tray were connected using dental floss and an acrylic resin. Connecting the transfers assisted in ensuring the



Figure 1. Placement of gingival former
Slika 1. Postavljene kapice za zarastanje mekih tkiva

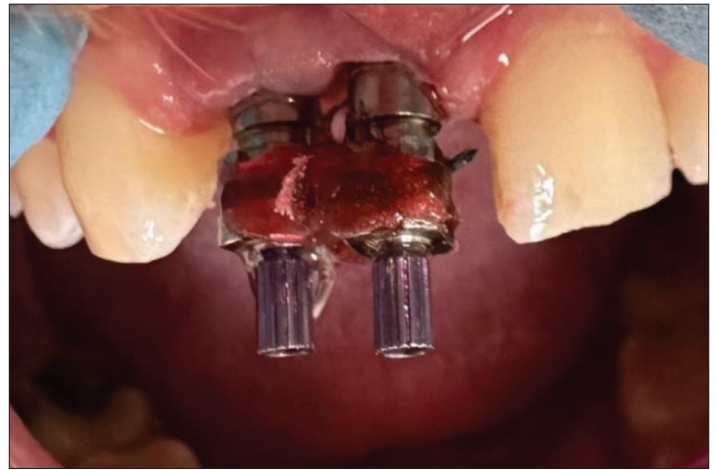


Figure 2. Connection of the impression coping
Slika 2. Povezani prenosnici



Figure 3. Impression with placed analogs
Slika 3. Realizovan jednovremeni otisak sa postavljenim replikama implantata



Figure 4. Temporary crowns
Slika 4. Privremene krunice



Figure 5. Preparation for re-contouring of temporary crowns
Slika 5. Fiksirane privremene krunice pripremljene za preoblikovanje

accuracy of the impression and cast. The impression tray was coated with adhesive and loaded with VPS (Elite HD+ Putty Soft, Zhermack). Concurrently light-body impression material (Elite HD+ Light Body, Zhermack) was expressed around the transfers to capture the morphology of the soft tissue and into the impression tray over the heavy body impression material. After the impression was taken, the analogs were tightened to copings (Figure 3).

When the provisional crowns were fabricated, the soft tissue conditioning began. The material was removed from the deep contour of the crown to obtain an adequate emergence profile. Also, the superficial contour of the crowns was developed to support marginal mucosa and papillae and to mimic the contralateral site. A provisional two-unit bridge was fabricated with functional occlusal contact with opposing teeth. During the three months of temporization, three-dimensional peri-implant soft tissue changes were validated, and the provisional

restoration was re-contoured every two weeks to mold the tissue (Figures 4–7).

After completion of the temporary screw-retained crown (Mantis Cheme CAD-CAM), we started recontouring its transmucosal part (Figures 4, 5, and 6). Primarily, the material was removed from the subcritical contour of the crown to obtain an optimal emergence profile. A slightly concave shape of the subcritical contour of the crown will allow sufficient space for a stable blood clot (Figure 6). Contrary, the convex shape of the critical contour of the crown will provide support for the cervical soft tissue margin (Figure 6). During the 12 weeks of temporization,

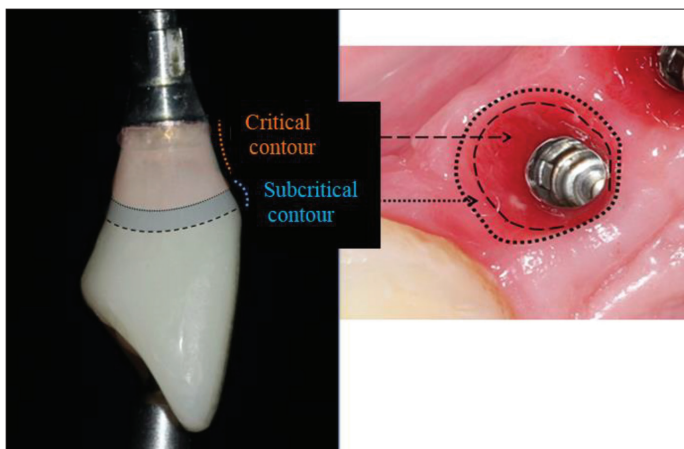


Figure 6. Remodeling of transmucosal part of temporary crown according to the characteristics of supracrestal connective tissue
Slika 6. Remodelacija transmukoznog dela privremene zubne nadoknade prema karakteristikama suprakrestalnog vezivnog tkiva



Figure 10. Placement of customized impression copings for open tray technique
Slika 10. Intraoralno postavljene individualni prenosnici

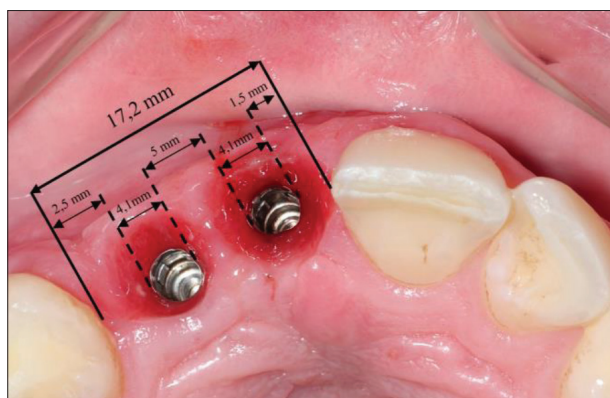


Figure 7. Mesio-distal space for final crowns
Slika 7. Raspoloživi prostor za definitivne zubne nadoknade

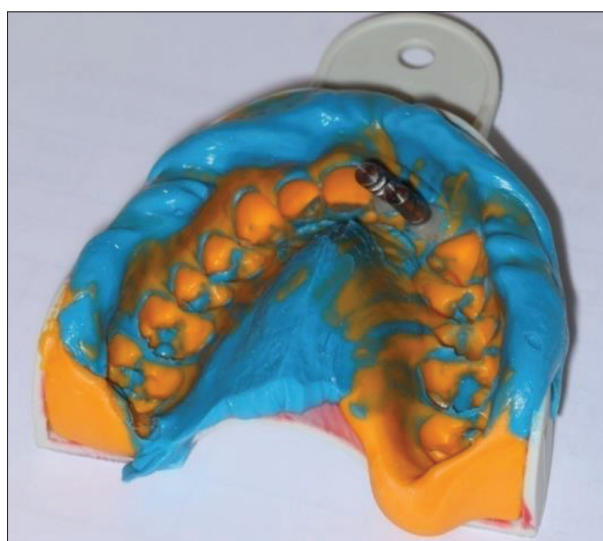


Figure 11. Definitive impression - customized impression coping technique
Slika 11. Definitivni otisak realizovan tehnikom individualizovanog prenosnika



Figure 8. Emergence profile after 12 weeks
Figure 8. Izgled mekih tkiva nakon 12 nedelja

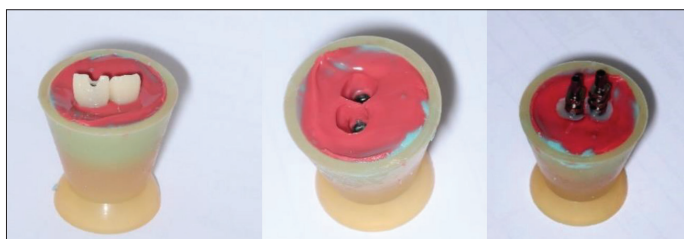


Figure 9. Registering the emergence profile of the provisional crowns
Slika 9. Registrovanje izlaznog profila privremene nadoknade u elastičnom otisnom materijalu

supracrestal connective tissue was periodically re-scaled and the three-dimensional changes were validated. After 12 weeks, when adequate soft tissue architecture was achieved (Figure 8), the impression for definitive crowns was taken via individual transfer technique to register the emergence profile of the provisional crowns (Figure 9). This served as a customized impression where the transfer was tightened to analog and the gap between transfer and polyvinyl siloxane was poured with self-polymerizing acrylic resin.

In order to register and transfer the obtained emergence profile to the definitive cast, the customized impression copings were created in three steps (figure 9). The impression of the transmucosal part of temporary crowns was indexed in VPS material. This served as a precise impression where copings for the open tray technique were placed and tightened to the analogs. The space between copings and impression materials was filled with light-cured resin (Figure 9). Thus, customized copings served



Figure 12. Definitive implant-supported restorations- all ceramic screw-retained crowns
Slika 12. Definitivna nadoknada – keramički hibridne krunice

for the transfer of soft tissue architecture to the definitive cast (Figures 10 and 11). Definitive restoration was fabricated and placed a week after taking the definitive impression (Figure 10).

DISCUSSION

Delayed implant loading protocol enables the osseointegration and soft tissue maturation. This loading protocol is based on the concept that increased vertical or lateral force upon the implant during the healing process results in implant motion, abnormal healing, and fibrous tissue encapsulation [9, 10].

Soft tissue management procedures are frequently performed both simultaneously with, and post-implant placement in order to improve the aesthetic, functional, and biological outcomes of implant therapy [7, 11, 12].

Insufficient soft tissue volume can have a great impact on the final results of the implant reconstruction. Results of contemporary investigations have shown that mucosal thickness has a high influence on color changes of the mucosa [13, 14] and plays a crucial role in soft tissue aesthetics [15, 16]. Thin peri-implant soft tissue is also linked to a greater risk of developing recession [17] as well as a negative effect on marginal bone levels [18-20].

Marginal bone loss (MBL) is a parameter vital for considering the attainment and maintenance of implant osseointegration [21]. Marginal bone loss around implants is affected by different parameters such as the thickness of the peri-implant mucosa, the quality of the surrounding bone tissue, the macro- and micro design of the implant, and the design of the implant-abutment interface [21–25].

The stability of the peri-implant soft tissues is a crucial factor for a natural appearance and good rehabilitation and prevention of bone reabsorption. The healthy peri-implant mucosal interface has been linked with the conservation of marginal bone and long-term implant success [21]. In cases such as this one, where high aesthetics is of utmost importance, soft tissue management is recommended with delayed implant placement to

reduce soft tissue recession [11]. Therefore, to deliver a natural-looking final restoration, the management of the transgingival region can be properly guided using provisional two-unit bridge.

CONCLUSION

This case report describes a soft tissue management technique, where remodeling the provisional restoration allows the soft tissue to be reshaped. Individual transfer impression technique provides an accurately captured emergence profile of the soft tissue contours around implants in the aesthetic zone. This method provides definitive restoration to be shaped exactly like provisional, leading to healthy soft tissue contours as well as satisfactory esthetical results.

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Oblikovanje mekih tkiva pri odloženom opterećenju implantata u estetskoj regiji – prikaz slučaja

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KRATAK SADRŽAJ

Izlazni profil mekih tkiva implantatno nošenih zubnih nadoknada definisan je karakteristikama suprakrestalnog vezivnog tkiva lokalizovanog između platforme implantata i cervikalne ivice mekih tkiva. U ovom radu je opisana metoda oblikovanja izlaznog profila hibridnih krunica na implantatima uz pomoć individualizovanog prenosnika sa fokusom na usmereno preoblikovanje mekih tkiva. Kod pacijenta starog 27 godina ugrađeni su endoosealni implantati (Straumann BLT Ø 4.1 × 12 mm) u regijama koje odgovaraju pozicijama zuba 12 i 11. Navedeni zubi su prethodno izvađeni zbog cistične promene u istoimenoj regiji. Prateći protokol odloženog opterećenja, implantati su otvoreni četiri meseca nakon ugradnje i izrađene su privremene krunice kako bi se formirala estetski zadovoljavajuća marginalna gingiva i papila. Tokom tri meseca kondicioniranja mekih tkiva zabeležene su promene, a privremene krunice su remodelovane periodično oduzimanjem i dodavanjem kompozita. Otisak za definitivne krunice je realizovan tehnikom individualizovanih prenosnika formiranih pomoću izlaznih profila privremenih krunica.

Primenjena metoda obezbeđuje oblikovanje transmukoznog dela definitivne nadoknade prema rezultatima dobijenim usmerenom dinamičkom kompresijom, što dovodi do zdravih kontura mekih tkiva i do zadovoljavajućih estetskih rezultata.

Cljučne reči: suprakrestalno vezivno tkivo; oblikovanje mekih tkiva; šrafom retinirane krunice; estetska zona; otisak pomoću individualizovanog prenosnika

UVOD

Pored adekvatnog dizajna i morfologije implantatno nošenih zubnih nadoknada, meka tkiva igraju važnu ulogu u biološkom i sveukupnom estetskom aspektu [1]. Nakon perioda oseointegracije postignutog protokolom odloženog opterećenja implantata, završni koraci oblikovanja mekih tkiva i dalje predstavljaju izazov. S obzirom na to da se cilindričan oblik implantata i kapice za zarastanje mekih tkiva ne poklapa sa konturama prirodnog izlaznog profila oko zubne krunice, neretko se primenjuju i dodatne intervencije u domenu mukogingivalne hirurgije kako bi se postigli zadovoljavajući estetski rezultati. Ipak, ukoliko se obezbedi optimalna trodimenzionalna pozicija implantata uz prisustvo adekvatnog fenotipa mekih tkiva, moguće je restaurativnim metodama formirati željenu konturu transmukoznog dela periimplantnih tkiva [2].

Prema literaturno dostupnim podacima, da bi se obezbedili uslovi za postizanje optimalnog izlaznog profila, neophodno je da postoji 3 do 4 mm vertikalne dimenzije suprakrestalnog vezivnog tkiva koje čine vezivno tkivo i pripojni epitel [3].

Periimplantna mukoza se razlikuje od gingive prirodnih zuba pre svega zbog smanjene vaskularizacije i paralelno orijentisanih vlakana vezujućeg periimplantnog tkiva. Dodatno, veća permeabilnost u odnosu na epitelni pripoj prirodnih zuba uslovljava veću podložnost ka inflamaciji. Navedeno posledično može dovesti do gubitka koštanog tkiva uslovljenog mikrobima [4, 5]. Usmeranim oblikovanjem mekih tkiva, tj. sprovođenjem tehnike dinamičke kompresije u periimplantnoj regiji moguće je obezbediti uslove za pravilno održavanje oralne higijene uz poštovanje anatomskih struktura mekih tkiva [6]. Sa protetskog aspekta, krajnji cilj je ponovno kreiranje izgubljene mekotkivne konture prirodnog zuba. Studije pokazuju različite pristupe i procedure lečenja [7, 8].

Cilj ovog rada je bio da se prikaže klinički slučaj usmerenog kondicioniranja periimplantnih mekih tkiva rekonturiranjem privremenih krunica na implantatima u estetskoj zoni.

PRIKAZ SLUČAJA

Pacijent star 27 godina javio se na Kliniku za oralnu hirurgiju Univerziteta u Beogradu sa nedostatkom centralnog i lateralnog sekutića u gornjoj vilici sa desne strane. Zubi su prethodno izvađeni zbog cistične formacije u pomenutoj regiji. Nakon uspostavljenog terapijskog plana, endoosealni implantati (Straumann BLT Ø 4,1 × 12 mm) ugrađeni su u regijama koje odgovaraju pozicijama zuba 12 i 11, sa dodatkom koštanog ksenotransplantata (Geistlich Bio-Oss). Ugradnja je izvršena prema smernicama protetskog nadoknadom vođene implantacije. Vodeći se protokolom odloženog opterećenja, implantati su otvoreni četiri meseca nakon ugradnje (Slika 1).

Dve nedelje od postavljanja kapica za zarastanje mekih tkiva, realizovan je jednovremeni otisak metodom otvorene kašike za izradu privremenih nadoknada. Kašika za otiskivanje (Miratray® Implant) prethodno je pripremljena adhezivom, a potom napunjena vinil-polisiloksanom (Elite HD+ Putty Soft, Zhermack) gušće konzistencije. Oko prenosnika je plasiran elastomer ređe konzistencije (Elite HD+ Light Body, Zhermack). Po realizaciji otiska, analozi su pričvršćeni za prenosnike (Slika 3).

Na izrađenim privremenim krunicama od PMMA materijala (Mantis Cheme CAD-CAM) započeto je rekonturiranje (slike 4, 5 i 6). Materijal je uklonjen sa duboke konture krune da bi se dobio adekvatan izlazni profil. Formiranjem umereno konkavnog oblika duboke konture krune sa vestibularne površine obezbeđeno je prorastanje vezivnog tkiva i pripojnog epitela (Slika 6). Suprotno tome, subpovršinska kontura kruna je remodelovana dodavanjem kompozitnog materijala tako da dobije konveksan oblik koji će podržati marginalnu sluzokožu i papile (Slika 6). Nakon predaje individualno preoblikovanog privremenog rada započeto je kondicioniranje mekih tkiva. Privremene krunice su izrađene tako da ostvaruju funkcionalne okluzalne kontakte sa antagonistima, prema konceptu uzajamno štićene okuzije. Tokom tri meseca temporizacije, potvrđene su trodimenzionalne promene mekog tkiva oko implantata, a privremene zubne nadoknade su rekonturirane periodično dodavanjem kompozita da bi se izvršila usmerena remodelacija mekih tkiva.

Nakon 12 nedelja, kada je postignuta adekvatna arhitektura mekog tkiva (slike 7 i 8), realizovan je otisak za definitivne krunne tehnikom individualizovanog prenosnika. U cilju registracije novoformiranih izlaznih profila oko privremenih krunica, izrada individualnih prenosnika sprovedena je u tri koraka (Slika 9). Indeks transmukoznog dela privremenih kruna je zabeležen u elastičnom otisnom materijalu. Tako dobijena impresija poslužila je kao precizan otisak gde su prenosnici fiksirani za implantat replike, a prostor između prenosnika i vezanog otisnog materijala je popunjen tečnim kompozitom (Slika 9). Prilagođeni prenosnici poslužili su za transfer arhitekture mekih tkiva na definitivni radni model (slike 10 i 11). Definitivna nadoknada je predata nakon nedelju dana (Slika 12).

DISKUSIJA

Korišćeni protokol odloženog opterećenja implantata omogućava oseointegraciju i zarastanje mekog tkiva. Prednosti ovog koncepta zasnovane su na činjenici da povećana vertikalna i/ili bočna sila usmerena na implantat tokom procesa koštanog i mekotivnog zarastanja dovodi do mikropokreta, abnormalnog zarastanja i inkapsulacije fibroznog tkiva [9, 10].

Procedure oblikovanja mekih tkiva se često izvode istovremeno sa implantacijom i nakon nje kako bi se poboljšali estetski, funkcionalni i biološki ishodi implantološke terapije [7, 11, 12].

Nezadovoljavajući volumen mekog tkiva može imati veliki uticaj na konačni rezultat protetske rehabilitacije implantatima. Rezultati savremenih istraživanja su pokazali da debljina sluzokože ima veliki uticaj na promene boje sluzokože [13, 14] i da ima ključnu ulogu u estetici mekih tkiva [15, 16]. Tanko periimplantno meko tkivo je takođe povezano sa većim rizikom

od razvoja recesije [17], kao i sa negativnim efektom na nivoe marginalne kosti [18, 19, 20].

Marginalni gubitak kosti je parametar od vitalnog značaja za održavanje osteointegracije implantata [21]. Na marginalni gubitak koštanog fundamenta oko implantata utiču različiti parametri, kao što su debljina periimplantatne sluzokože, kvalitet okolnog koštanog tkiva, makro i mikro dizajn implantata i dizajn veze implantat–abatment [21–25].

Stabilnost periimplantnih mekih tkiva je presudan faktor za prirodan izgled, dobru rehabilitaciju i prevenciju resorpcije kosti. Zdrava mukoza oko implantata je povezana sa očuvanjem marginalne kosti i dugoročnim uspehom implantata [21]. U slučajevima kao što je ovaj klinički prikaz, gde je visoka estetika od najveće važnosti, preporučuje se oblikovanje mekih tkiva uz odloženo postavljanje implantata kako bi se smanjila recesija mekog tkiva [11]. U cilju dobijanja konačne restauracije prirodnog izgleda, od ključnog značaja je da se usmeri zarastanje mekih tkiva u željenom pravcu.

ZAKLJUČAK

Individualna tehnika otiskivanja prenosnika obezbeđuje precizno izrađen izlazni profil kontura mekog tkiva oko implantata u estetskoj zoni. Ova metoda obezbeđuje definitivnu nadoknadu koja će biti oblikovana tačno kao privremena, što dovodi do zdravih kontura mekih tkiva i do zadovoljavajućih estetskih rezultata.

ZAHVALNICA

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