

Preetinder Singh, Suresh DK

## Prekrivanje korijena korištenjem GEM 21S® i kolagene membrane, predviđajući povoljan ishod terapije: prikaz slučaja

### Root Coverage Using GEM 21S® and Collagen Membrane Predicting Favourable Treatment Outcomes: A Case Report

<sup>1</sup> Zavod za parodontologiju i oralnu implantologiju, Swami Devi Dyal Hospital & Dental College, Barwala, Distt.Panchkula (Haryana) INDIA  
*Department of Periodontology & Oral Implantology, Swami Devi Dyal Hospital & Dental College, Barwala, Distt.Panchkula (Haryana) INDIA*

<sup>2</sup> Zavod za parodontologiju i oralnu kirurgiju, Mullana (AMBALA), Haryana, INDIA  
*Department of Periodontology & Oral Implantology, MMCDJR, Mullana (AMBALA), Haryana, INDIA*

#### Sažetak

U dosadašnjim istraživanjima istaknuto je da humani rekombinantni čimbenik rasta iz trombocita, kao snažna bjelančevina za cijeljenje rane, može poboljšati klinički nalaz epitelnog pričvrstka i regeneraciju parodontnog tkiva kada se pomiješa s osteoinduktivnim nosačem. U ovom prikazu procijenjen je klinički ishod primjene rhPDGF-BB-a s beta-trikalcijevim fosfatom (GEM 21S®) i kolagenom membranom u terapiji recesijskih defekata pomoću koronarno odignutog režnja. Pacijenti su nakon zahvata bili pod nadzorom te se pratilo cijeljenje nakon jednog, tri i šest mjeseci, a primarni je pokazatelj bila dubina recesije. Ovaj pionirski rad je otkrio povoljan klinički i estetski odgovor tkiva na GEM 21S® i kolagene membrane jer su u dvama kliničkim slučajevima korijeni nakon zahvata bili potpuno prekriveni.

Zaprimljen: 29. lipanj 2010.

Prihvaćen: 16. kolovoz 2010.

#### Adresa za dopisivanje

Dr.Preetinder Singh  
H.no 28, Sangam Enclave, Sector 48-A,  
Chandigarh (160047) INDIA  
tel.: 0091-9915652946  
preetinder.perio@yahoo.com

#### Ključne riječi

parodontalne bolesti; trombociti; faktor rasta, trombocitni; rana, cijeljenje; zub, korijen; parodont

#### Uvod

Gingivna recesija bila je određena prema pomaku gingivnog ruba u apikalnom smjeru od cementno-caklinskog spoja (1). Uz zubni cement i alveolarnu kost zabilježen je gubitak parodontnih vlakana vezivnoga tkiva (2).

Uzroci recesije bili su parodontne bolesti, nepravilna oralna higijena, povlačenje frenuluma, resorpcija kosti, loše restauracije, nepovoljan smještaj zuba, virusne infekcije gingive i subgingivni kamenac (3-17). Istaknimo da recesija gingive uzrokuje hiperosjetljivost površine korijena, lošu estetiku i cervikalni karijes korijena (18, 19). Obično se liječi plastičnom kirurgijom parodonta kako bi se ispravili i deformiteti gingivne sluznice (20). Liječnici obavljaju različite mukogingivalne zahvate, poput stvaranja slobodnoga gingivnog režnja, lateralno ili koronarno pomaknutog režnja, te vodenu tkivnu regeneraciju (GTR) i presađivanje vezivnog tkivnoga režnja (21-26).

Pročišćeni rekombinantni humani PDGF (rhPDGF), u kombinaciji sa sintetskim nosačima kao što su beta trikalcijev fosfat (b-TCP) ili alografi, analizirani su u mnogim strogim pretkliničkim pokusima i njihovi rezultati obećavaju (27-31). U mnogim se istraživanjima ističe da PDGF-BB djeluje

#### Introduction

Gingival recession is defined as the displacement of the gingival margin apical to the cemento-enamel junction (1). It is characterized by the loss of periodontal connective tissue fibres, along with tooth cementum and alveolar bone (2).

The causes of gingival recession are periodontal disease, improper oral hygiene, frenal pull, bone dehiscence, improper restorations, tooth malposition, viral infections of the gingiva and subgingival calculus formation (3-17). Recession of the gingival tissue causes root hypersensitivity, poor esthetic appearance and cervical root caries (18,19). Gingival recession defects are typically treated by periodontal plastic surgery to correct or eliminate the deformities of the gingival mucosa (20). Various mucogingival procedures have been used, including creation of free gingival grafts, laterally positioned flaps or coronally positioned flaps, as well as guided tissue regeneration (GTR) and connective tissue grafting (21-26).

Purified recombinant human PDGF (rhPDGF), in combination with synthetic matrices such as beta tricalcium phosphate (b-TCP) or allografts, has been studied in a series of rigorous clinical and preclinical trials that have yielded

poput magneta za promicanje brze migracije stanica (kemotaksijom) u području ozljede s posljedičnom proliferacijom (mitogeneza) osteoblasta i fibroblasta parodontnog ligamenta pomoću vezivanja za dobro istražene receptore na staničnoj površini. (32-37). PDGF se pokazao važnim i u embrionalnom razvoju (38).

Preliminarni klinički rezultati upućuju na to da se na recesijski defekt može učinkovito djelovati rhPDGF-om i kolagenskom mrežicom ili membranom te koronarno pomaknutim režnjem kao alternativom presađivanju subepitelnog vezivnog režnja. U eksperimentalnoj kliničkoj studiji o kojoj su izvijestili McGuire i Scheyer, rhPDGF je primijenjen na recesijske defekte > 3 mm (31). Njihovi rezultati sugeriraju da je rhPDGF uz kolagenu membranu učinkovito prekrilo recesijske defekte kod vezivno-tkivnog presađivanja, bez potrebe za drugim kirurškim područjem.

Nova, moćna tehnologija samocijeljenja rana i regeneracije kostiju nazvana je matriks za pojačavanje čimbenika rasta (GEM 21S®) i od nedavno se stručnjaci njome koriste u kliničkom radu (proizvođač je BioMimetic Therapeutics, TN, SAD). Taj materijal sadržava koncentriranu otopinu čistoga rekombinantnog humanog faktora rasta iz trombocita (rhPDGF-BB), sintetski oblik stimulatora prirodnog cijeljenja rana PDGF-BB i osteoinduktivne matrice (koštanu mrežicu). To je prvi pročišćeni, rekombinirani (sintetski) hormon rasta nakon više od desetljeća opsežnih istraživanja. Klinički rezultati, kako na ljudima tako i na životinjama, pokazuju da je moguće istodobno potaknuti cijeljenje rana, regenerirati kost i ubrzati povratak gingivnog pričvrstka kod parodontoloških i periimplantacijskih defekata.

Svrha ovog prikaza bila je procijeniti kliničke regenerativne učinke GEM 21S® u kombinaciji s kolagenom membranom (Healiguide™) primijenjenom kod koronarno pomaknutog režnja tijekom terapije recesijskog defekta u sklopu prekrivanja korijena.

### Prikaz slučaja

Između pacijenata koji su izjavili da žele prekriti površine korijena, izabrano je dvoje s gingivnom recesijom klase II prema Milleru od ≥ 3 mm na gornjem lijevom očnjaku jer su zadovoljili kriterije. To su bili zdrava 35-godišnja žena i muškarac u dobi od 42 godine.

Oboje su potpisali informirani pristanak koji je odobriilo mjerodavno povjerenstvo. Svaki je predstavljao i sam sebi kontrolu, te su na taj način uklonjeni vanjski čimbenici koji bi mogli utjecati na rezultat liječenja, poput oralne higijene. Nakon odabira i inicijalnog pregleda, pacijenti su dobili upute kako održavati oralnu higijenu. Na mjestima terapije preporučena im je tehnika četkanja s minimalnim apikalno usmjerenim silama na meka tkiva. Kirurška terapija recesijskih defekata nije počela sve dok pacijenti nisu mogli pokazati mogu li kontrolirati supragingivni plak.

Liječnici su se odlučili koristiti trima materijalima. Predložili su GEM 21S®, kolagene membrane (Healiguide™) i 24-postotni EDTA kao biomodifikator korijena, zato što zajedno potiču cijeljenje rane te poboljšavaju uraštavanje sta-

ed promising results (27-31). Numerous studies have shown that PDGF-BB acts as a magnet to promote rapid cell migration (chemotaxis) into the injured region with subsequent proliferation (mitogenesis) of osteoblasts and periodontal ligament fibroblasts by binding to well-characterized cell surface receptors (32-37). PDGF has also been shown to be important during embryonic development (38).

Preliminary clinical results indicate that recession defects also may be effectively treated with rhPDGF and a collagen pad or membrane and a coronally advanced flap as an alternative to subepithelial connective tissue grafting. In a pilot clinical trial reported by McGuire and Scheyer, rhPDGF was applied to recession defects > 3 mm.<sup>31</sup> Results of the study suggest that rhPDGF plus a collagen membrane was as effective in covering recession defects as connective tissue grafting, without the need for a second surgical site.

A new, powerful off-the-shelf wound healing and bone regeneration technology termed growth-factor enhanced matrix (GEM 21S®) has recently become available for clinical use. (It is a product of BioMimetic Therapeutics, TN, USA). This graft material consists of a concentrated solution of pure recombinant human platelet-derived growth factor (rhPDGF-BB), the synthetic form of the body's key natural wound healing stimulator PDGF-BB, and an osteoconductive (bone scaffold) matrix. This is the first available purified, recombinant (synthetic) growth factor product and is the result of over a decade of extensive research. Clinical and animal study results with this graft material demonstrate that it is capable of simultaneously promoting wound healing, regeneration of bone, and acceleration of gingival attachment gain in challenging periodontal and periimplant defects.

The objective of the current case report was to evaluate the clinical regenerative effects of GEM 21S® in combination with collagen membrane (Healiguide™) using coronally advanced flap for the treatment of recession defects as part of root coverage.

### Case report

Two patients with Miller Class II buccal gingival recession of ≥ 3 mm who met the inclusion/ exclusion criteria were selected from patients seeking treatment for root coverage. The two patients, a 35-year-old systemically healthy female and 42 year old male presented with Miller Class II recession of 3 mm depth in upper left canines. A signed institutional review board-approved consent form regarding the study was obtained from each patient. Each patient served as his or her own control, so that extraneous factors such as oral hygiene and compliance were controlled within each subject. Following screening examination, the subjects received instruction in proper oral hygiene measures. At the treatment sites, a brushing technique was prescribed that minimized apically directed forces to the soft tissue. Surgical treatment of the recession defects was not scheduled until the patient could demonstrate adequate supragingival plaque control.

The materials were composed of three components: GEM 21S®, collagen membrane (Healiguide™) and 24% EDTA as root biomodifier. Together these materials promote wound

ničnih elemenata u recesijske defekte. Dodatno, sprječavaju urušavanje mekog tkiva na površinu korijena i olakšavaju stabilizaciju krvnog ugruška osiguravajući osteoinduktivnu mrežicu za novu regeneraciju tkiva. U inicijalnoj fazi su na gipsanim modelima bili izrađeni individualno modelirani akrilatni stentovi na okluzalnim površinama zuba koji će biti podvrgnuti terapijskom postupku, kako bi se osigurala reproducibilnost slijednih mjerenja. Stent je bio udubljen tijekom kirurškog zahvata da se može bilježiti orijentacija sonde. Sonda je položena uz bukalnu površinu do maksimalne dubine recesije.

#### Procjenjivani klinički parametri (39)

1. Vertikalna dubina recesije gingive (GR)
2. Razina kliničkog pričvrstka (CAL)
3. Klinička dubina sondiranja (PD)
4. Širina keratiniziranog tkiva (WKT)

#### Kirurški postupak (Slike od 1. do 12.)

Nakon procjene predkliničkih podataka i odgovarajuće lokalne anestezije, učinjena su dva zaobljena reza mezijalno i distalno od recesijskog defekta smještenog na udaljenosti od vrha interdentalne papile do dubine recesije plus jedan milimetar. Slijedila su još dva zaobljena i blago divergentna reza koji su počinjali na krajevima dvaju uzdužnih rezova i protezali se do alveolarne sluznice.

Od stvorena trapeznoga reza podignut je režanj uz pristup "podijeli-odigni-podijeli" u koronarno-apikalnom smjeru. Rasteretni okomiti rezovi odignuti su i razdijeljeni oštricom paralelnom s površinom kosti, a istodobno se štedio periost radi zaštite kosti ispod u lateralnim dijelovima reznja. Apikalno uz kost, podizanje i cijepanje reznja obavljalo se sve dok nije bilo moguće pasivno pomaknuti režanj u koronarnom smjeru.

Kako bi se omogućio koronarni pomak reznja, uklonjena su sva hvatišta mišića. Koronarni pomak reznja smatra se odgovarajućim ako je njegov rubni dio moguće pasivno pomaknuti koronarno i zadržati na razini cementno-caklinskoga spoja (CEJ-a) zuba s recesijskim defektom.

Vestibularni dio mekog tkiva anatomske interdentalne papile koronarno od horizontalnog reza, deepiteliziran je, te je stvoreno ležište vezivnoga tkiva na koje je prišivena papila koronarno pomaknutog reznja (40). Ogoljela površina korijena zuba, nakon temeljitog čišćenja, dvije je minute kondicionirana 24-postotnim EDTA kako bi se uklonio zaostali sloj te zatim temeljito isprana sterilnom fiziološkom otopinom.

Sačuvano je sve preostalo tkivo parodontnog ligamenta koronarno od alveolarne kosti. Otopina rhPDGF-BB-a nanjena je na izloženu površinu korijena i na vlakna koronarnog ligamenta. Mala količina  $\beta$ -TCP-a zasićena je otopinom rhPDGF-BB-a i postavljena ispod CEJ-a preko ogoljele površine korijena, prekrivajući dva do tri milimetra susjednu kost.

Kolagena membrana također je natopljena PDGF-otopinom prije nego što je postavljena membrana. Zatim je postavljena preko beta TCP-a prema smjericama standardne tkivno vođene regeneracije te zašivena obostrano na deepitelizirana područja papila.

healing by improving and promoting cellular ingrowth into the recession defect. In addition, they physically prevent the collapse of the soft tissues onto the root surface and facilitate the stabilization of blood clot by providing an osteoconductive scaffold for new tissue regeneration.

Custom made acrylic stents were fabricated on plaster/stone casts prepared during initial phase, on the occlusal surfaces of teeth to be treated to ensure reproducibility at subsequent measurement. Stent was grooved at the time of surgery to record the orientation of the probe. The probe was oriented on buccal surface at maximum depth of recession to it.

#### Clinical parameters assessed(39):

1. Vertical gingival recession depth (GR)
2. Clinical attachment level (CAL)
3. Clinical probing depth (PD)
4. Width of keratinized tissue (WKT)

#### Surgical Procedure (Figure 1-12)

After evaluation of pre clinical records and obtaining adequate local anaesthesia, two horizontal bevelled incisions were given, mesial and distal to the recession defect located at a distance from the tip of the anatomical papillae equal to the depth of the recession plus 1 mm. This was followed by two bevelled oblique, slightly divergent, incisions starting at the end of the two horizontal incisions and extending to the alveolar mucosa.

The resulting trapezoidal-shaped flap was elevated with a split-full-split approach in the coronal-apical direction. The releasing vertical incisions were elevated split thickness keeping the blade parallel to the bone plane, thus leaving the periosteum to protect the underlying bone in the lateral areas of the flap. Apical to bone exposure flap elevation continued split thickness and finished when it was possible to move the flap passively in the coronal direction.

In order to permit the coronal advancement of the flap, all muscle insertions present in the thickness of the flap were eliminated. Coronal mobilization of the flap was considered "adequate" when the marginal portion of the flap was able to passively reach a level coronal to the CEJ of the tooth with the recession defect.

The facial soft tissue of the anatomic inter-dental papillae coronal to the horizontal incisions was deepithelized to create connective tissue beds to which the surgical papillae of the coronally advanced flap were sutured (40). The exposed root surface, after thorough root planing, was conditioned with ethylenediamine-tetraacetic acid (EDTA- 24 %) for 2 minutes to remove the smear layer and thoroughly rinsed with sterile saline.

Any remaining PDL tissue coronal to the alveolar bone was preserved. The rhPDGF-BB solution was then applied to the exposed root surface and to the coronal ligament fibers. A small amount of  $\beta$ -TCP was saturated with the rhPDGF-BB solution and placed below the CEJ, over the denuded root surface and extending approximately 2 to 3 mm onto the adjacent bone.

The collagen membrane was also saturated with the PDGF solution prior to membrane placement. Once saturated, the membrane was placed over the beta TCP accord-



**Slika 1.** Slučaj prvi: Mjerenje recesije akrilatnim stentom i UNC-sondom

**Figure 1** Case 1: Measuring recession with acrylic stent and UNC probe.

**Slika 2.** Uzdužni rez

**Figure 2** Horizontal Incision.

**Slika 3.** Okomiti rez

**Figure 3** Vertical Incision.

**Slika 4.** Cervikalni rez

**Figure 4** Crevicular Incision.

**Slika 5.** Odizanje režnja

**Figure 5** Flap Elevation.

**Slika 6.** Aplikacija 24-postotnog EDTA na površinu korijena

**Figure 6** Application of 24 % EDTA to root surface.

**Slika 7.** Aplikacija rhPDGF otopine

**Figure 7** Application of rhPDGF solution.

**Slika 8.** Beta TCP namočen u rhPDGF otopinu

**Figure 8** Beta TCP soaked in rhPDGF Solution

**Slika 9.** Aplikacija beta TCP i rhPDGF mješavine

**Figure 9** Application of beta TCP and rhPDGF mixture.

**Slika 10.** Postavljanje kolagene membrane

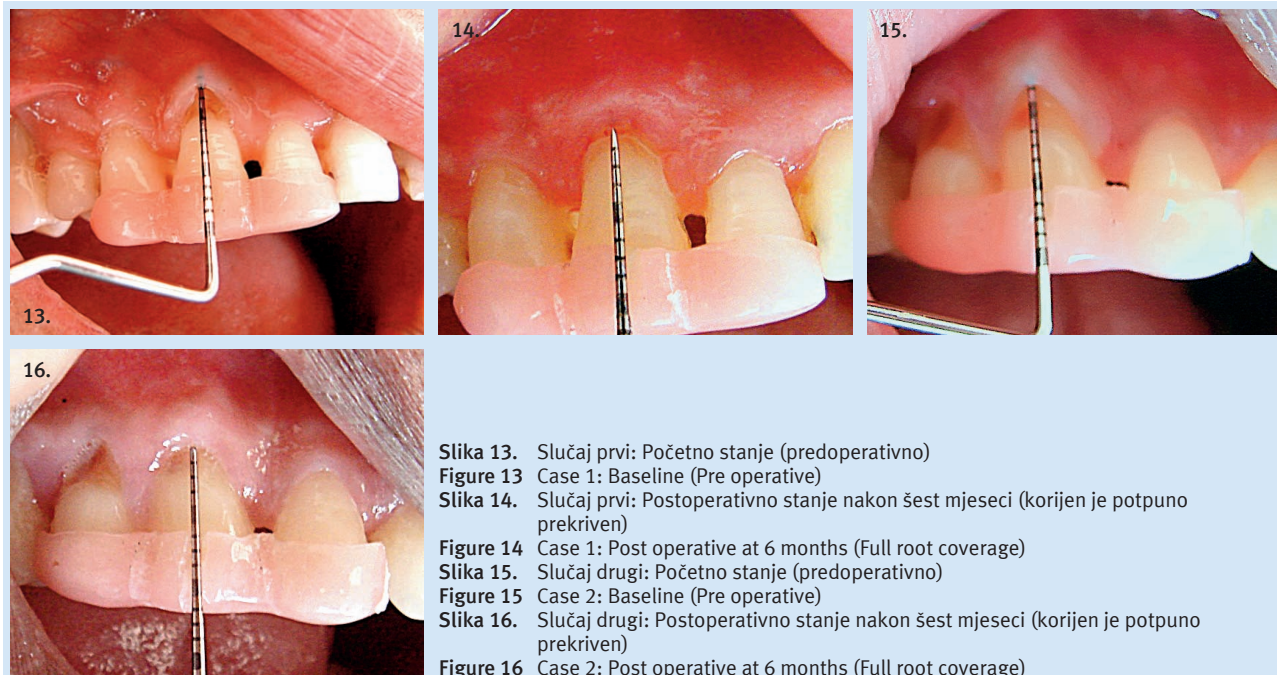
**Figure 10** Placement of collagen membrane.

**Slika 11.** Šivanje kolagene membrane

**Figure 11** Suturing of collagen membrane.

**Slika 12.** Koronarni nastavak režnja i šivanje

**Figure 12** Coronal advancement of flap and sutured.



**Slika 13.** Slučaj prvi: Početno stanje (predoperativno)

**Figure 13** Case 1: Baseline (Pre operative)

**Slika 14.** Slučaj prvi: Postoperativno stanje nakon šest mjeseci (karijen je potpuno prekriven)

**Figure 14** Case 1: Post operative at 6 months (Full root coverage)

**Slika 15.** Slučaj drugi: Početno stanje (predoperativno)

**Figure 15** Case 2: Baseline (Pre operative)

**Slika 16.** Slučaj drugi: Postoperativno stanje nakon šest mjeseci (karijen je potpuno prekriven)

**Figure 16** Case 2: Post operative at 6 months (Full root coverage)

Na kraju je membrana prekrivena koronarno pomaknutim režnjom. Režanj je tada zašiven 5-0 resorbirajućim koncem na razini CEJ-a šivanjem na deepitelizirana područja papila. Vertikalni rezovi zatvoreni su istom vrstom konca. Preostala otopina rHPDGF-BB-a raspoređena je na koronarno pomaknuti režanj, a nakon toga postavljeni su tanka folija i parodontni zavoj.

Pacijenti su dobili postoperativne savjete i lijekove. Kao antibiotska terapija ordiniran im je bio amoksicilin i kloksacilin u kombinaciji, te otopina diklofenaka i paracetamol kao protuupalni lijekovi. Propisana im je bila i dvotjedna uporaba vode za ispiranja usne šupljine na bazi klorheksidina dva puta na dan.

#### Postoperativni tijek i kontrola:

Pacijenti su pozvani 24 sata nakon terapije na kontrolu radi procjene nelagode, otekline, bolova, krvarenja ili pomaka periodontalnog zavoja. Tjedan dana nakon kirurškog zahvata skinut im je parodontni zavoj i područje je isprano fiziološkom otopinom. Zavoj im je ponovno postavljen zbog mogućega nedovoljnog cijeljenja.

Pacijenti su mjesec dana dolazili na kontrolu svaka dva tjedna i zatim jedanput na mjesec sve do šest mjeseci nakon zahvata. Svaki put im je bilo pregledano operirano područje. Predoperativna mjerenja bila su ponovljena nakon jednog, tri i šest mjeseci poslije operativnog zahvata.

#### Opazanja (Slike od 13. do 16.)

Nakon šest mjeseci više nije bilo recesije. Različiti predoperativni te postoperativni parametri prikazani su u tablicama 1. i 2., a pokazali su 100-postotno smanjenje dubine gingivne recesije te poboljšane vrijednosti CAL-a, PD-a i WKT-a u usporedbi s početnim stanjem i šest mjeseci posli-

ing to standard GTR surgical procedure and sutured bilaterally to the de-epithelialized papilla region.

Subsequently, the membrane was covered with the coronally advanced flap. The tissue flap was then secured at the level of the CEJ by suturing the flap to the de-epithelialized papilla regions with 5-0 resorbable sutures. The vertical incisions were closed with 5-0 resorbable sutures. Any remaining rHPDGF-BB solution was dispensed onto the coronally advanced flap, followed by placement of tin foil and periodontal dressing.

Requisite post operative instructions and medications were advised to the patient. The patients were given amoxicillin and cloxacillin combination for antibiotic coverage and a combination of diclofenac sodium and paracetamol as an anti-inflammatory drug. Chlorohexidine mouthwash was also prescribed twice daily for two weeks to every patient.

#### Post Surgical Follow up

Patients were called after 24 hours for check up to evaluate any discomfort, swelling, pain, any bleeding or displacement of periodontal pack. One week following surgery, periodontal pack was removed and area irrigated with saline, repeat periodontal pack was placed in case of uneventful healing.

Patients were recalled every 2 weeks following surgery for 1 month and subsequently every month for the next 6 months for examination of the treated surgical site. Clinical measurements recorded pre-operatively, were repeated at 1<sup>st</sup> month, 3<sup>rd</sup> month and 6<sup>th</sup> month post-operatively.

#### Results (Figure 13-16)

At 6 months, there was no residual recession. Various parameters recorded at baseline and post-operatively are shown in the table 1 and 2 indicating 100 % reduction in gingival recession depth and appreciable values of CAL, PD and WKT when compared from baseline to 6 months. The tis-

**Tablica 1.** Parodontni parametri (GR - recesija gingive, CAL - klinička razina pričvrška) kod pacijenata opisanih u prikazu  
**Table 1** Periodontal parameters (GR - gingival recession, CAL - clinical attachment level) in reported patients

Parameteri • Parameters		GR				CAL		
Pacijent • Patient	Područje • Site	Početno stanje • Baseline	1. mjesec • 1 <sup>st</sup> month	3. mjesec • 3 <sup>rd</sup> month	6. mjesec • 6 <sup>th</sup> month	Početno stanje • Baseline	3. mjesec • 3 <sup>rd</sup> month	6. mjesec • 6 <sup>th</sup> month
1.	13	3	1	0	0	6	2	2
2.	13	3	1	0	0	6	2	1

**Tablica 2.** Parodontni parametri (WKT - širina keratinizirane gingive, PD - dubina sondiranja) kod pacijenata opisanih u prikazu  
**Table 2** Periodontal parameters (WKT - width of keratinized tissue, PD - probing depth) in reported patients

Parameteri • Parameters		WKT				PD		
Pacijent • Patient	Područje • Site	Početno stanje • Baseline	1. mjesec • 1 <sup>st</sup> month	3. mjesec • 3 <sup>rd</sup> month	6. mjesec • 6 <sup>th</sup> month	Početno stanje • Baseline	3. mjesec • 3 <sup>rd</sup> month	6. mjesec • 6 <sup>th</sup> month
1.	13	4	6	7	7	3	2	2
2.	13	4	6	7	7	3	2	1

je. Prema izgledu je kod oboje pacijenata tkivo bilo zdravo i bez znakova upale.

### Rasprava

Ovaj slučaj dokazuje da je recesiju parodontnog defekta moguće riješiti s GEM 21S® i kolagenom membranom te koronarno pomaknutim režnjom, s optimalnim rezultatima kada je riječ o različitim kliničkim parametrima (Tablice 1. i 2.) te esteticu. Različita istraživanja potvrdila su uspješno korištenje rhPDGF-BB-a i koštanih graftova kod parodontnih defekata, kao što su to učinili Myrons Nevins i suradnici (29), Myron Nevins (28) te M. Camelo i njegovi kolege. (27).

Ovaj ciljani terapijski postupak obećava kod predviđanja regenerativnih rezultata i to kombinacijom pasivnih nosača koji se danas mogu nabaviti na tržištu, a imaju fizikalna i kemijska svojstva koja pomažu staničnom prijanjanju i uraštanju uz pomoć visoko pročišćenog i koncentriranog rhPDGF-a koji bioaktivno potiče cijeljenje. Daljnja klinička ispitivanja i stečena iskustva pomoći će u razvoju regeneracije i poboljšanju kirurških tehnika kako bi se optimizirao klinički ishod. A spoznaje tijekom praćenja dvaju opisanih slučajeva pokazuju da primjena rhPDGF-a pomiješanog s TCP-om može osigurati izvrsne kliničke rezultate.

### Zaključak

Nakon praćenja serije slučajeva može se zaključiti da korištenje GEM 21S® i kolagene membrane može biti prihvatljiva alternativa različitim drugim postupcima prekrivanja gingivnih recesijskih defekata. Opisani slučajevi bili su kratko kliničko ispitivanje na malom broju uzoraka i bez histološke procjene. Buduća istraživanja trebala bi se obaviti na velikom broju ispitanika i s histološkom procjenom, radi daljnje usporedbe i lakšeg predviđanja navedenih postupaka jer u literaturi o toj temi nema mnogo podataka.

sues at sites in both the patients appeared healthy, with no visible signs of inflammation.

### Discussion

This case report proves the principle that it is possible to treat periodontal recession type defects with GEM 21S® and a collagen membrane with a coronally advanced flap with optimum results in terms of various clinical parameters (as shown in table 1 and 2) and aesthetic point of view.

Various studies have supported the concept of using rhPDGF-BB and bone grafts in periodontal defects such as done by Myrons Nevins et al (29), Myron Nevins (28) and Camelo M et al (27).

This targeted therapeutic approach promises to increase the predictability of regenerative outcomes by combining the mostly passive scaffolds that have been present to date, and that have physical and chemical characteristics that aid in cell attachment and ingrowth, with highly purified, concentrated rhPDGF, which provides a bioactive stimulus for healing. Further clinical investigation and experience will continue to elucidate the requirements for predictable regeneration and the surgical techniques to optimize clinical outcomes, but observation of the present clinical cases suggests that rhPDGF mixed with TCP can provide excellent clinical results.

### Conclusion

Within the limits of this case series, the use of GEM 21S® and a collagen membrane may represent an acceptable alternative to various other procedures for covering gingival recession defects. The present study was short term clinical study with small sample size and no histological evaluation. Studies should be designed with large sample sizes and histological evaluation to further compare the predictability of above said procedures, as there is paucity of literature regarding the same.

**Abstract**

On mixing with an osteoconductive scaffold, recombinant human platelet derived growth factor (rhPDGF-BB), a potent wound-healing protein, has been shown to promote clinical attachment gain and regeneration of the periodontium. This human case report evaluated the clinical outcome of rhPDGF-BB with beta tricalcium phosphate (GEM 21S®) and a collagen membrane in the treatment of recession defects using coronally advanced flap. Patients were followed postoperatively, and healing was evaluated at 1, 3 and 6 months, with recession depth as the primary outcome measure. This pioneer case report revealed a favourable tissue response to GEM 21S® and collagen membrane from both clinical and aesthetic point of view showing full root coverage in two cases.

Received: June 29, 2010

Accepted: August 16, 2010

**Address for correspondence**

Dr. Preetinder Singh,  
H.no 28, Sangam Enclave, Sector 48-A,  
Chandigarh (160047) INDIA  
Tel: 0091-9915652946  
preetinder.perio@yahoo.com

**Key words**

Periodontal Disease; Blood Platelet-Derived Growth Factor; Wound Healing; Tooth Root; Periodontium

**References**

- American Academy of Periodontology. Glossary of Periodontology Terms. Chicago: American Academy of Periodontology; 2001.
- Santarelli GA, Ciancaglini R, Campanari F, Dinioi C, Ferraris S. Connective tissue grafting employing the tunnel technique: a case report of complete root coverage in the anterior maxilla. *Int J Periodontics Restorative Dent.* 2001 Feb;21(1):77-83.
- Contreras A, Slots J. Active cytomegalovirus infection in human periodontitis. *Oral Microbiol Immunol.* 1998 Aug;13(4):225-30.
- Löe H, Anerud A, Boysen H. The natural history of periodontal disease in man: prevalence, severity, and extent of gingival recession. *J Periodontol.* 1992 Jun;63(6):489-95.
- Serino G, Wennström JL, Lindhe J, Eneroth L. The prevalence and distribution of gingival recession in subjects with a high standard of oral hygiene. *J Clin Periodontol.* 1994 Jan;21(1):57-63.
- Tözüm TF, Berker E, Ersoy F, Tezcan I, Sanal O. The relationship between periodontal status and peripheral levels of neutrophils in two consanguineous siblings with severe congenital neutropenia: case reports. *Quintessence Int.* 2003 Mar;34(3):221-6.
- Goldstein M, Nasatzky E, Goultschin J, Boyan BD, Schwartz Z. Coverage of previously carious roots is as predictable a procedure as coverage of intact roots. *J Periodontol.* 2002 Dec;73(12):1419-26.
- Trott JR, Love B. An analysis of localized gingival recession in 766 Winnipeg High School students. *Dent Pract Dent Rec.* 1966 Feb;16(6):209-13.
- Löst C. Depth of alveolar bone dehiscences in relation to gingival recessions. *J Clin Periodontol.* 1984 Oct;11(9):583-9.
- Donaldson D. Gingival recession associated with temporary crowns. *J Periodontol.* 1973 Nov;44(11):691-6.
- Lindhe J, Socransky SS, Nyman S, Westfelt E. Dimensional alteration of the periodontal tissues following therapy. *Int J Periodontics Restorative Dent.* 1987;7(2):9-21.
- Peacock ME, Mott DA, Cuenin MF, Hokett SD, Fowler EB. Periodontal plastic surgical technique for gingival fenestration closure. *Gen Dent.* 2001 Jul-Aug;49(4):393-5.
- Sangnes G, Gjermo P. Prevalence of oral soft and hard tissue lesions related to mechanical toothcleansing procedures. *Community Dent Oral Epidemiol.* 1976 Mar;4(2):77-83.
- Wilson RD. Marginal tissue recession in general dental practice: a preliminary study. *Int J Periodontics Restorative Dent.* 1983;3(1):40-53.
- Agudio G, Pini Prato G, Cortellini P, Parma S. Gingival lesions caused by improper oral hygiene measures. *Int J Periodontics Restorative Dent.* 1987;7(1):52-65.
- Pini Prato G. Mucogingival deformities. *Ann Periodontol.* 1999 Dec;4(1):98-101.
- Blue AH. Periodontal plastic procedures in esthetic dentistry. *Tex Dent J.* 2001 Oct;118(10):972-6.
- Prato GP, Clauser C, Tonetti MS, Cortellini P. Guided tissue regeneration in gingival recessions. *Periodontol 2000.* 1996 Jun;11:49-57.
- Anson D. Periodontal esthetics and soft-tissue root coverage for treatment of cervical root caries. *Compend Contin Educ Dent.* 1999 Nov;20(11):1043-6, 1048-50, 1052.
- Miller PD Jr. Root coverage grafting for regeneration and aesthetics. *Periodontol 2000.* 1993 Feb;1(1):118-27.
- Miller PD Jr. Root coverage using the free soft tissue autograft following citric acid application. III. A successful and predictable procedure in areas of deep-wide recession. *Int J Periodontics Restorative Dent.* 1985;5(2):14-37.
- de Waal H, Kon S, Ruben MP. The laterally positioned flap. *Dent Clin North Am.* 1988 Apr;32(2):267-85.
- Thompson BK, Meyer R, Singh GB, Mitchell W. Desensitization of exposed root surfaces using a semilunar coronally positioned flap. *Gen Dent.* 2000 Jan-Feb;48(1):68-71.
- Pini Prato G, Clauser C, Cortellini P, Tinti C, Vincenzi G, Pagliaro U. Guided tissue regeneration versus mucogingival surgery in the treatment of human buccal recessions. A 4-year follow-up study. *J Periodontol.* 1996 Nov;67(11):1216-23.
- Tözüm TF, Dini FM. Treatment of adjacent gingival recessions with subepithelial connective tissue grafts and the modified tunnel technique. *Quintessence Int.* 2003 Jan;34(1):7-13.
- Wang HL, Kimble K, Eber R. Use of bone grafts for the enhancement of a GTR-based root coverage procedure: a pilot case study. *Int J Periodontics Restorative Dent.* 2002 Apr;22(2):119-27.
- Camelo M, Nevins ML, Schenk RK, Lynch SE, Nevins M. Periodontal regeneration in human Class II furcations using purified recombinant human platelet-derived growth factor-BB (rhPDGF-BB) with bone allograft. *Int J Periodontics Restorative Dent.* 2003 Jun;23(3):213-25.
- Nevins M, Camelo M, Nevins ML, Schenk RK, Lynch SE. Periodontal regeneration in humans using recombinant human platelet-derived growth factor-BB (rhPDGF-BB) and allogenic bone. *J Periodontol.* 2003 Sep;74(9):1282-92.
- Nevins M, Giannobile WV, McGuire MK, Kao RT, Mellonig JT, Hinrichs JE et al. Platelet-derived growth factor stimulates bone fill and rate of attachment level gain: results of a large multicenter randomized controlled trial. *J Periodontol.* 2005 Dec;76(12):2205-15.
- McGuire MK, Kao RT, Nevins M, Lynch SE. rhPDGF-BB promotes healing of periodontal defects: 24-month clinical and radiographic observations. *Int J Periodontics Restorative Dent.* 2006 Jun;26(3):223-31.
- McGuire MK, Scheyer ET. Comparison of recombinant human platelet-derived growth factor-BB plus beta tricalcium phosphate and a collagen membrane to subepithelial connective tissue grafting for the treatment of recession defects: a case series. *Int J Periodontics Restorative Dent.* 2006 Apr;26(2):127-33.
- Lynch SE, Genco RJ, Marx RE, editors. *Tissue engineering: Applications in maxillofacial surgery and periodontics.* Chicago, Ill: Quintessence Publishing Co; 1999.
- Lynch SE, Williams RC, Polson AM, Howell TH, Reddy MS, Zappa UE et al. A combination of platelet-derived and insulin-like growth factors enhances periodontal regeneration. *J Clin Periodontol.* 1989 Sep;16(8):545-8.
- Centrella M, McCarthy TL, Kusmik WF, Canalis E. Relative binding and biochemical effects of heterodimeric and homodimeric isoforms of platelet-derived growth factor in osteoblast-enriched cultures from fetal rat bone. *J Cell Physiol.* 1991 Jun;147(3):420-6.
- Piché JE, Graves DT. Study of the growth factor requirements of human bone-derived cells: a comparison with human fibroblasts. *Bone.* 1989;10(2):131-8.
- Bowen-Pope DF, van Koppen A, Schatteman G. Is PDGF really important? Testing the hypotheses. *Trends Genet.* 1991 Nov-Dec;7(11-12):413-8.
- Soriano P. Abnormal kidney development and hematological disorders in PDGF beta-receptor mutant mice. *Genes Dev.* 1994 Aug 15;8(16):1888-96.
- Schatteman GC, Morrison-Graham K, van Koppen A, Weston JA, Bowen-Pope DF. Regulation and role of PDGF receptor alpha-subunit expression during embryogenesis. *Development.* 1992 May;115(1):123-31.
- Wang HL, Bunyaratavej P, Labadie M, Shyr Y, MacNeil RL. Comparison of 2 clinical techniques for treatment of gingival recession. *J Periodontol.* 2001 Oct;72(10):1301-11.
- de Sanctis M, Zucchelli G. Coronally advanced flap: a modified surgical approach for isolated recession-type defects: three-year results. *J Clin Periodontol.* 2007 Mar;34(3):262-8.