

Evaluation of mucosal scar characteristics after periodontal plastic surgery

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SUMMARY

Introduction Gingival recession is the most common mucogingival anomaly, as well as the most frequent periodontal plastic surgery indication. The surgical procedure and healing of the wound result in scar formation, which impacts oral soft tissue aesthetics.

The aim of this study was to evaluate the characteristics of a postsurgical scar after gingival recession treatment using the mucosal scarring index (MSI).

Material and methods In accordance with the MSI, ten standardized and calibrated photographs of the postsurgical site, taken 3-6 months following the surgical procedure, were analyzed. That included the evaluation of six parameters: scar appearance, scar length, suture marks, contour, color, and overall appearance. 30 professionals divided into the three groups conducted the scar analysis: 10 dental students (S), 10 periodontology and oral medicine residents (SS) and 10 periodontal specialists (SP).

Results The average MSI values showed the following results: S: 3.63 ± 2.71 , SS: 3.63 ± 2.83 and SP: 3.12 ± 2.75 . There was no difference between the MSI values obtained in the three groups ($p=0.544$).

Conclusion Due to the similar MSI values among all the groups, a conclusion may be drawn that by the application of this index, the aesthetic evaluation of the postsurgical scar after the gingival recession treatment can be done in a fast and simple way. Further research based on a larger sample and various surgical procedures is necessary in order to confirm these statements.

Keywords: gingival recession; periodontal plastic surgery; wound healing

INTRODUCTION

Mucogingival anomalies appear as a consequence of anatomic-morphological irregularities in mucogingival complex that consists of keratinized gingiva, alveolar mucosa, as well as mucogingival line [1]. All mucogingival anomalies are related to keratinized tissue width reduction, they result in increased biofilm accumulation and they directly or indirectly influence the appearance, prognosis, progression and treatment of periodontal disease.

Gingival recession is the most common mucogingival anomaly that is characterized by the apical migration of gingiva, followed by dental root exposure being a serious functional and aesthetic problem [2]. Beside the root exposure, thermal, mechanical or chemical hypersensitivity may occur as well. This issue may lead to the appearance of root cavities or erosion, thus significantly enlarging dental biofilm accumulation [3].

The treatment of gingival recession is surgical. The aim of the treatment is to cover the exposed root surface, eliminate the aforementioned factors, and change the tissue biotype with minimal negative impacts on the soft tissue appearance [4].

After the surgical procedure, the wound heals by scar formation. "The scar represents macroscopic disturbance of the normal structure and function of the tissue ar-

chitecture" [5]. The process of wound healing undergoes four stages: haemostasis, inflammation, proliferation and maturation. The maturation stage is significant from the aspect of scar evaluation because it can last up to a year after the surgical procedure. The scar disturbs the tissue harmony leading to unsatisfactory aesthetics.

Considering that mucogingival tissues are part of dentofacial aesthetics and that one of the reasons for periodontal plastic surgery is disturbed aesthetics, there is a need for an index, such as MSI. This index can be used in objective evaluation of a scar that appears as result of not only periodontal plastic surgery procedure, but also any other surgical procedure.

In medical field, there are several indices for scar evaluation, such as *Vancouver scar scale* [6], *visual-analogical scale* (VAS) [7], *The patient and observer scar assessment scale* (POSAS) [8], *The Manchester scar scale* [9], *Stoney Brook scar evaluation scale* [10]. However, all of them are designed to evaluate scars on the skin. Although there is no difference between mucosal and skin wound healing process, it is obvious that mucosal wounds heal faster leading to the occurrence of smaller and less visible scars [11]. For that reason, another index called the mucosal scarring index (MSI) was created.

In the era of aesthetic dentistry, there are several methods used for aesthetical evaluation of both soft and hard tissues, such as: Root coverage esthetic score (RES) [12],



Figure 1. A photo with a periodontal probe
Slika 1. Fotografija sa parodontalnom sondom



Figure 2. A photo without a probe
Slika 2. Fotografija bez sonde



Figure 3. Calibrated photo
Slika 3. Kalibrisana fotografija

Pink esthetic score (PES) [13], White esthetic score (WES) [14], Mucosal scarring index (MSI).

The aim of this research was to evaluate the characteristics of postsurgical scar after the gingival recession treatment using the mucosal scarring index (MSI).

MATERIAL AND METHODS

The research included 10 patients who received the treatment of gingival recession by the application of the surgical technique of coronally advanced flap in combination with cone tissue graft. All patients were photographed three to six months after the surgical procedure using the same photographing parameters (aperture: $f/22$; shutter speed: $1/250$ and ISO 100) with the aim of getting standardized photographs, which were later calibrated and used for the evaluation in accordance with the MSI. The calibration process is shown in the Figures 1–3.

Having been introduced to the MSI, 30 professionals divided into the three 10-member groups (students, residents and periodontal specialists) evaluated the scars. During the evaluation process, the photographs were shown on a big screen. The MSI includes the evaluation of the following parameters: scar appearance, scar length, suture marks, contour, color, and overall appearance. Depending on the parameter, score ranging from 0 to 2 can be assigned (Table 1).

The sum of all scores within the MSI is 10 and represents the worst aesthetic result, whereas the minimum sum of 0 means the best outcome of the treatment in terms of scar absence and satisfactory soft tissue aesthetics.

RESULTS

The average time needed for the evaluation of one photograph was one minute. The statistical analysis was conducted in IBM SPSS Statistics 20 software using *Kruskal Wallis* and *Hi* square tests. The analysis of the average scores within the same group ($S: 3.63 \pm 2.71$, $SS: 3.63 \pm 2.83$; $SP: 3.12 \pm 2.75$) did not show statistically significant differences among the groups ($p=0.544$).

After the average score analysis, the scores were analyzed based on the parameters and no statistically significant differences were found. Although in terms of the scar visibility the results lacked statistically significant differ-

Table 1. MSI index (index for oral tissue scarring)

Tabela 1. MSI indeks (indeks zarastanja oralnih tkiva)

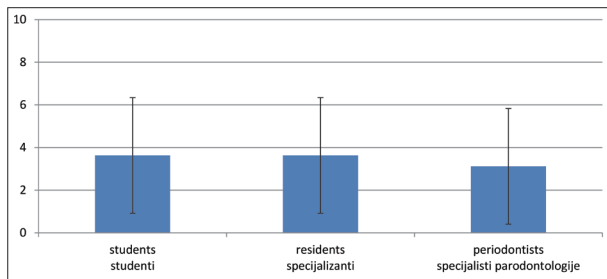
	Scar category Izgled ožiljka	Score Ocena
Scar appearance Prisustvo ožiljka	Invisible Nevidljiv	0
	Visible Vidljiv	1
	Up to 3 mm Do 3 mm	0
	Scar length Dužina ožiljka	
	3–6 mm 3–6 mm	1
	Over 6 mm Preko 6 mm	2
Suture marks Tragovi šavova	Invisible Nevidljivi	0
	Partly visible Delimično vidljivi	1
	Clearly visible Jasno vidljivi	2
	Contour Odnos prema okolnom tkivu	Flush with surrounding mucosa U nivou sa susednim tkivom
Above/below surrounding mucosa Ispod/iznad susednog tkiva		1
Color Boja	The same Ista	0
	Partly different Delimično različita	1
	Obviously different Jasno različita	2
	Overall appearance Opšti utisak	Good Dobro
Acceptable Prihvatljivo		1
Bad Loše		2

ences, they were interesting in that the students, being the least qualified group, noticed scars to a greater extent than the members of the other two groups.

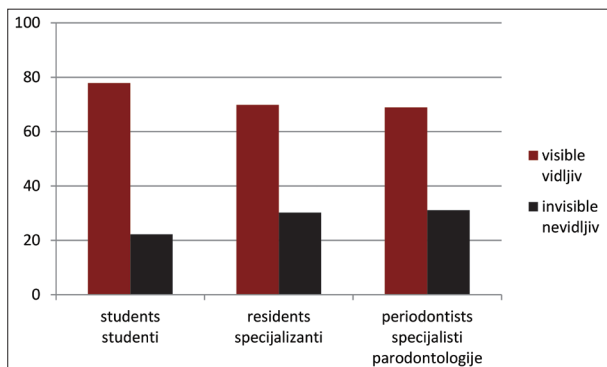
The only parameter indicating statistically significant differences was the contour. Interesting result is the inverse proportionality among the groups, which can be clearly seen in the Graphs (1-3).

DISCUSSION

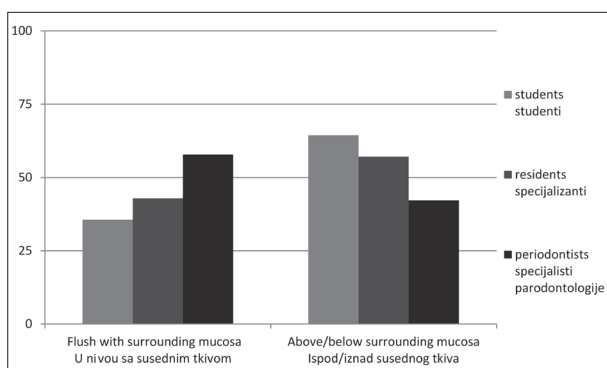
Beside current study, to the best of our knowledge, the only research dealing with the application of this index



Graph 1. Average score within groups
Grafikon 1. Prosečne ocene po grupama



Graph 2. Scar visibility
Grafikon 2. Vidljivost ožiljka



Graph 3. Scar contour
Grafikon 3. Odnos prema okolnoj sluzokoži

was the study of Retief Wessel et al. [15]. The average MSI value in their study was 4.91 ± 3.087 with no statistically significant differences among various groups of researchers (periodontologists, orthodontists and prosthodontists). The results of both studies are comparable. An interesting finding of the present study refers to the fact that the only parameter showing statistically significant differences was tissue contour. The presence of such difference only in terms of this parameter may be explained by fact that a photograph is two-dimensional presentation of a three-dimensional object, so the likelihood of making mistake during the evaluation process of this parameter was the highest.

Nowadays, surgical techniques and state-of-the-art surgical instruments have evolved in a way that periodontal plastic surgery procedures are carried out with a minimal tissue traumatization, and minimal scar occurrence or its absence [16]. Not only that dental photography completes medical records of a patient, but also it is useful for the

analysis of all aesthetic parameters, including scars. Its advantage lies in the fact that aesthetic parameters can be analyzed without the presence of a patient, and obtained results can be monitored by taking photographs at different times.

Having in mind that during the scar color evaluation process it was not required to evaluate qualitative characteristics, but rather the degree of dissimilarity, i.e. similarity to the color of the surrounding tissue, the parameters used in the process of photographing the patients were recommended and aforementioned ones, as well as the parameter of auto white balance.

CONCLUSION

The MSI is simply and quickly applied in all oral cavity surgical procedures and easily repeated. Dental photography is becoming an unavoidable aspect of contemporary dental practice. The importance of these records arises from the opportunity to evaluate achieved results aesthetically, considering the importance of photo calibration.

Further research based on larger sample and in various groups is necessary in order to confirm these statements. Having in mind that the scar maturation stage lasts up to a year following the surgical procedure, it would be interesting to repeat the scar evaluation during various postsurgical periods.

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Evaluacija karakteristika mukoznog ožiljka posle parodontalnih plastičnohirurških intervencija

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KRATAK SADRŽAJ

Uvod Recesija gingive predstavlja najčešću mukogingivalnu anomaliju, kao i najčešću indikaciju za parodontalnu plastičnu hirurgiju. Kao rezultat hirurške intervencije i zarastanja rane dolazi do formiranja ožiljka, koji utiče na estetiku mekih oralnih tkiva.

Cilj rada je bio evaluacija karakteristika postoperativnog ožiljka posle hirurške terapije recesije gingive primenom indeksa zarastanja oralnih tkiva (IZO).

Materijal i metode Deset standardizovanih i kalibrisanih fotografija posthirurške regije napravljenih tri do šest meseci posle hirurške intervencije analizirano je u skladu sa IZO, koji obuhvata procenu šest parametara: prisustvo ožiljka, dužinu ožiljka, tragove šavova, odnos prema okolnom tkivu, boju, kao i opšti utisak. Procenu ožiljka vršilo je 30 stručnih lica podeljenih u tri grupe: 10 studenata osnovnih studija (S), 10 studenata specijalističkih studija iz parodontologije i oralne medicine (SS) i 10 specijalista parodontologije i oralne medicine (SP).

Rezultati Srednje vrednosti IZO po grupama pokazale su sledeće vrednosti: S: $3,63 \pm 2,71$, SS: $3,63 \pm 2,83$ i SP: $3,12 \pm 2,75$. Vrednosti IZO između tri grupe nisu pokazale statistički značajnu razliku ($p = 0,544$).

Zaključak S obzirom na slične vrednosti IZO kod svih grupa ispitivača, može se zaključiti da se primenom ovog indeksa na brz i jednostavan način može vršiti estetska evaluacija postoperativnog ožiljka posle terapije recesije gingive. Potrebna su dalja istraživanja na većem uzorku pacijenata i kod različitih hirurških intervencija u cilju potvrde ovih tvrdnji.

Ključne reči: recesija gingive; parodontalna plastična hirurgija; zarastanje rane

UVOD

Mukogingivalne anomalije nastaju kao posledica anatomomorfoloških nepravilnosti u mukogingivalnom kompleksu parodontalnih tkiva koji čine keratinizovana gingiva (slobodna i pripojna), alveolarna mukoza, kao i granična mukogingivalna linija [1]. U osnovi, sve mukogingivalne anomalije su povezane sa redukovanom širinom pripojne gingive, te direktno ili indirektno utiču na nastanak, prognozu, progresiju i terapiju oboljenja potpornog aparata zuba.

Recesija gingive je najčešća mukogingivalna anomalija, koju karakteriše apikalna migracija marginalne gingive uz ekspoziciju korena zuba, što predstavlja kompleksan funkcionalno-estetski problem [2]. Pored ekspaniranosti korena zuba, može biti prisutna i njegova preosetljivost na termičke, mehaničke i hemijske nadražaje. Problem dalje komplikuje mogućnost pojave karijesa korena zuba ili erozije korena, što bitno utiče na povećanu akumulaciju plaka [3].

Terapija recesije gingive je hirurška. Cilj terapije je pre svega prekrivanje ogoljene površine korena zuba, uz sanaciju gore navedenih faktora, kao i promenu tkivnog biotipa uz minimalno narušavanje prirodne estetike tkiva [4].

Po sprovedenoj intervenciji dolazi do zarastanja hirurške rane, što rezultira formiranjem ožiljka. Ožiljak predstavlja makroskopski poremećaj normalne građe i funkcije tkiva [5]. Sam proces zarastanja rane prolazi kroz četiri faze: hemostaza, inflamacija, proliferacija i remodelacija. Faza remodelacije ožiljka je značajna sa aspekta njegove evaluacije jer traje i do godinu dana posle intervencije. Formirani ožiljak narušava harmoniju tkiva dovodeći do nezadovoljavajuće estetike.

S obzirom na to da tkiva mukogingivalnog kompleksa čine sastavni deo dentofacijalne estetike, kao i da je jedan od razloga za parodontalnu plastičnu hirurgiju upravo popravljavanje narušene estetike, neophodno je postojanje indeksa pomoću kojih se može izvršiti objektivna evaluacija ožiljka nastalog kao

rezultat parodontalne plastičnohirurške intervencije, ali i bilo koje druge hirurške intervencije u ovoj regiji.

U medicinskoj nauci i praksi opisano je nekoliko indeksa za evaluaciju ožiljaka, kao što su Vankuverska skala ožiljka [6], Vizuelno-analogni skala (VAS) [7], Skala procene pacijenta i posmatrača (POSAS) [8], Mančesterska skala ožiljka [9], Evaluaciona skala ožiljka Stoni-Bruk [10]. Međutim, svi pomenuti indeksi su osmišljeni u cilju evaluacije ožiljaka kože. Iako razlike između zarastanja rane kože i oralne sluzokože nema, neminovno je da rane sluzokože zarastaju brže i uz formiranje manjih i teže uočljivih ožiljaka [11], zbog čega je osmišljen poseban indeks, indeks zarastanja oralne sluzokože.

U eri estetske stomatologije postoji nekoliko opisanih metoda za evaluaciju estetike kako mekih tako i čvrstih tkiva, kao što su: indeks prekrivenosti korena zuba (RES) [12], *Pink esthetic score* (PES) [13], *White esthetic score* (WES) [14], indeks zarastanja oralnih tkiva (IZO).

Cilj istraživanja bio je da se sprovede evaluacija postoperativnog ožiljka posle terapije recesije gingive primenom indeksa zarastanja oralnih tkiva.

MATERIJAL I METODE

U studiju je uključeno deset pacijenata kod kojih je sprovedena terapija recesije gingive primenom hirurške tehnike koronarno pomerenog režnja u kombinaciji s transplantatom vezivnog tkiva. Svi pacijenti su fotografisani tri do šest meseci posle hirurške intervencije pri uvek istim parametrima fotografisanja (otvor blende: f/22; brzina okidača: 1/250 i ISO 100) u cilju dobijanja standardizovanih fotografija, koje su potom kalibrisane i korišćene za evaluaciju u skladu sa indeksom zarastanja oralnih tkiva. Kalibracija fotografija je vršena na sledeći način:

Nakon upoznavanja sa indeksom zarastanja oralnih tkiva, evaluaciju ožiljaka vršilo je 30 stručnih osoba podeljenih u tri

grupe od po 10 članova: grupa studenata, grupa specijalizanata i grupa specijalista parodontologije i oralne medicine. Prilikom evaluacije fotografije su prikazivane na velikom ekranu.

Indeks zarastanja oralne sluzokože obuhvata evaluaciju sledećih parametara: prisustvo ožiljka, dužina ožiljka, tragovi šavova, odnos prema okolnom tkivu, boja i opšti utisak, pri čemu se, u zavisnosti od parametra, dodeljuju ocene od 0 do 2 (Tabela 1).

Maksimalan zbir svih ocena u okviru pomenutog indeksa iznosi 10 i označava najbolji estetski rezultat, dok je minimalan zbir 0 i označava najbolji ishod terapije u smislu izostanka ožiljka i zadovoljavajuće estetike mekih tkiva.

REZULTATI

Prosečno vreme potrebno za evaluaciju jedne fotografije iznosilo je jedan minut.

Statistička analiza obavljena je u programu IBM SPS Statistics 20 primenom testova *Kruskal Wallis* i χ^2 . Analiza prosečnih ocena u okviru grupe (S: $3,63 \pm 2,71$, SS: $3,63 \pm 2,83$ i SP: $3,12 \pm 2,75$) nije pokazala postojanje statistički značajne razlike među grupama ($p = 0,544$).

Posle analize prosečnih ocena, urađena je i analiza ocena po parametrima, gde uglavnom nije postojala statistički značajna razlika. Po pitanju vidljivosti ožiljka, iako nije bilo statistički značajne razlike, dobijeni su interesantni rezultati koji govore u prilog tome da studenti, kao najmanje kvalifikovana grupa, u nešto većoj meri uočavaju ožiljak u odnosu na članove preostale dve grupe.

Jedini parametar kod koga je uočeno postojanje statistički značajne razlike jeste odnos prema okolnoj sluzokoži. Interesantno je to što postoji obrnuta proporcionalnost među grupama, što se jasno vidi na grafikonu.

DISKUSIJA

Pored navedenog istraživanja, prema našim saznanjima jedino istraživanje koje se bavilo primenom ovog indeksa sprovedeno je u još jednoj studiji (*Retief Wessel et al.*). Prosečna vrednost indeksa zarastanja oralnih tkiva u pomenutom istraživanju iznosila je $4,91 \pm 3,087$, pri čemu nije bilo statistički značajne razlike između različitih grupa ispitača (grupa specijalista

parodontologije, ortopedije vilica i stomatološke protetike) [15]. Dobijeni rezultati u okviru obe studije međusobno su komparabilni. Zanimljiv nalaz ove studije odnosi se na činjenicu da je jedini parametar kod koga je uočeno postojanje statistički značajne razlike bio parametar odnosa ožiljka prema okolnoj sluzokoži. Postojanje ovakve razlike jedino po pitanju ovog parametra možda se može objasniti time da je fotografija dvodimenzionalni prikaz trodimenzionalnog objekta, te je i mogućnost greške prilikom evaluacije ovog parametra najveća.

Danas se, zahvaljujući evoluciji hirurške tehnike, ali i savremenim hirurškim instrumentima, parodontalne plastičnohirurške intervencije izvode uz minimalnu traumatizaciju tkiva, usled čega se posle ovih intervencija očekuje minimalno formiranje ožiljka ili njegovo odsustvo [16].

Pored toga što upotpunjuje medicinsku dokumentaciju pacijenta, dentalna fotografija je pogodna i za analizu svih estetskih parametara, pa samim tim i ožiljka. Njena prednost se ogleda u tome što se analiza estetskih parametara može izvršiti bez prisustva pacijenta, a dobijeni rezultati mogu pratiti poređenjem fotografija napravljenih u različito vreme.

S obzirom da ocenjivanje boje ožiljka nije zahtevalo ocenjivanje njenih kvalitativnih osobina, već samo uočavanje stepena različitosti, odnosno sličnosti sa bojom okolnog tkiva, prilikom fotografisanja pacijenata pored preporučenih, i gore navedenih parametara intraoralne fotografije, korišćen je i parametar automatskog balansa belog.

ZAKLJUČAK

Indeks zarastanja oralne sluzokože je jednostavan i brz za primenu i lako ponovljiv, a može se primenjivati kod svih hirurških intervencija u usnoj duplji.

Dentalna fotografija postaje nezaobilazan aspekt savremene stomatološke prakse. Značaj ovog vida dokumentacije ogleda se i u mogućnostima estetske evaluacije postignutih rezultata, kao što je slučaj u navedenom istraživanju, s tim da je u ovim slučajevima od značaja izvesna kalibracija fotografija.

Potrebna su dalja istraživanja, kako na većem uzorku, tako i među različitim grupama, kako bi se prethodno izneti rezultati dodatno potvrdili.

Imajući u vidu da faza remodelovanja ožiljka traje i do godinu dana od intervencije, bilo bi interesantno evaluaciju ožiljka ponoviti u različitim postoperativnim periodima.