

Impact of Subepithelial Connective Tissue for Root Coverage on Brazilian Patients' Quality of Life: A Longitudinal Clinical Study

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Abstract

Aims: Gingival recession has been associated with dentin hypersensitivity and aesthetic impairment. The impact of gingival recession and periodontal surgical procedures on adult patients' quality of life are scarce. The aim of this study was to evaluate the quality of life of patients submitted to root coverage procedures with subepithelial connective tissue grafts and coronally advanced flap.

Materials and methods: Patients were asked to use a numerical rating scale to classify their dentin hypersensitivity, aesthetics, pain/discomfort, chewing and brushing abilities in gingival recession sites treated with subepithelial connective tissue grafts plus coronally advanced flap. The patients answered a self-administered questionnaire about quality of life related to oral health (OHIP-14) after 7, 14, 30, 90, and 180 days. Descriptive statistics were used to synthesize the data recorded.

Results: Mean percentage of root coverage was positively related to OHIP-14 (dimension 2- physical pain) in 90 days postoperatively. The quality of life (OHIP-14 total score) significantly improved from baseline to 90 and 180 days postoperatively. The numerical rating score analysis revealed significant improvement in the chewing and brushing abilities when period of 7 days was compared to 90 and 180 days and from 14 to 180 days.

Conclusions: Root coverage procedures with subepithelial connective tissue grafts plus coronally advanced flap result in a positive effect on adult patients' quality of life.

Keywords. *Gingival recession, Quality of life, Periodontal plastic surgery*

INTRODUCTION

Gingival recession is described as the displacement of the gingival margin apical to the cement-enamel junction leading to dental root exposure (Glossary of Periodontal Terms, 2001). This condition may be associated with dentin sensitivity, lack of efficient plaque control, susceptibility to inflammation, root caries, and impaired aesthetics (Richardson *et al.*, 2015). Subepithelial connective tissue graft (SCTG) in conjunction with a coronally advanced flap (CAF) is considered the gold standard procedure, presenting high percentage of complete root

coverage (Chambrone *et al.*, 2010). However, periodontal plastic surgery, mainly with autogenous grafts, can often be associated with postoperative pain and discomfort when compared to flap/osseous surgeries (Curtis *et al.*, 1985). In most of the subepithelial connective tissue grafts procedures, the focus on evaluation is the donor area, which usually is the posterior palatal region near premolars and molars. Data on the perception of pain/discomfort at the recipient area are scarce, as well as the relation between percentage of root coverage and the reduction/resolution of root sensitivity (Gobbato *et al.*, 2016).

Studies concerning the impact of gingival recession and periodontal surgical procedures on adult patients' quality of life are scarce. One study (Needleman *et al.*, 2004) demonstrated that the presence of gingival

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recession is associated with deficient oral health-related quality of life (OHRQoL) in one or several aspects, including psychological and physical aspects. Another study (Ng and Leung, 2006) reported that recession defects are significantly associated with high scores of the Oral Health Impact Profile-14 (OHIP-14) as described by Slade (1997). The higher the scores of OHIP-14, the greater the negative impact on quality of life. The OHIP-14 consists of a questionnaire with 14 items scored on a scale ranging from 0 to 4 points, widely used to determine the impact of OHRQoL and validated for use in the Brazilian population (Oliveira and Nadanovsky, 2005). Thus, the objective of this prospective longitudinal clinical study was to evaluate the quality of life of adult patients submitted to subepithelial connective tissue grafts plus coronally advanced flap procedures for root coverage.

Materials and methods

Study design

All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1975 Helsinki declaration and its later amendments or comparable ethical standards.” Informed consent: Informed consent was obtained from all individual participants included in the study. The study protocol was approved by the Committee of Ethics in Research of the aforementioned Institution (#49806015.8.0000.5417).

The present prospective study was conducted in systemically healthy patients aged between 22-56 years and selected from Periodontal Plastic Surgery Clinic at Bauru School of Dentistry (University of Sao Paulo, Brazil).

The criterion for sample size calculation was set at $\alpha = 0.05$ (Type I error) and at $\beta = 0.20$ (Type II error). If an effect of 25 numerical rating score units (on the basis of 100 numerical rating score units) is expected, the sample size was 16 patients. Calculating a drop out rate of 20%, 19 patients are necessary, resulting in a power of 0.80 for an effect size of 25 numerical rating score units at a level of significance of $\alpha = 0.05$.

Inclusion criteria were: clinical diagnosis of single or multiple Miller's class I and II or Cairo's class RT1 gingival recessions with at least one gingival recession ≥ 2 mm in depth; absence of abrasion, erosion, or root caries. Exclusion criteria were: smokers; pregnant or lactating women; patients with previous history of periodontal disease or recurrent abscess formation; patients previously submitted to surgical procedures for root coverage; patients taking medication (anti-convulsant, antihypertensive, contraceptive or immunosuppressive drugs); and patients with poor oral hygiene (plaque index and / or bleeding on probing index $> 20\%$).

All patients received initial periodontal therapy (scaling, root planing and oral hygiene instruction) before the surgical procedures. Patients were required to maintain plaque index and bleeding on probing below 20% throughout the study period.

Surgical Procedure

The gingival recession defects were treated with subepithelial connective tissue grafts combined with coronally advanced flap according to the technique described by Zucchelli and De Sanctis (2000) by one experienced operator (MSRZ). Briefly, a modified design of the horizontal incision in the envelope flap was performed at the recipient sites in order to allow proper adaptation of the coronally advanced flap over the de-epithelialized interdental papillae. A full thickness envelope flap was raised in the coronal-apical direction until the mucogingival junction was reached. Then, the most apical portion of the flap was elevated in a split-thickness manner to allow the coronal displacement of the flap, surpassing at least 2.5 mm of the cement-enamel junction (CEJ). Root surfaces were scaled with periodontal curettes. subepithelial connective tissue grafts were harvested from the palate with approximately 1.5 mm of thickness and horizontal dimension covering the total area of gingival recession. The vertical dimension of the grafts coincided with the distance between the CEJ and the buccal bone crest level (Zucchelli *et al.*, 2010). The subepithelial connective tissue grafts were stabilized at CEJ with resorbable sutures and covered by a coronally advanced flap that was sutured at the interproximal papillae. All patients received the same analgesic and anti-inflammatory prescriptions and were instructed to gently rinse the mouth with alcohol-free chlorhexidine gluconate 0.12% twice daily for 4 weeks. After the surgical procedure, patients received verbal and written instructions on postoperative care. All patients were followed up after 7, 14, 30, 90 and 180 days of the surgical procedure. Sutures were removed after 14 days.

Clinical measurements of gingival recessions

All the data were collected by a single calibrated examiner (EBSC-intraclass correlation index=0.97). Mean percentage of root coverage was calculated based on gingival recession depth at baseline, 90 and 180 days postoperatively. The gingival recession depth was measured in millimeters from the CEJ to the gingival margin at central buccal surface with North Carolina periodontal probe No. 15 (Hu-Friedy, Positive Trade of Products for Health Ltda., Rio de Janeiro-RJ). The measurements were made for teeth individually and the mean value was considered for the teeth region of each patient to allow correlation with data from the OHIP-14 and numerical rating score questionnaires.

Quality of Life Evaluation

Numerical rating scores were obtained verbally from the patients to assess their satisfaction with aesthetics, and with the relation between clinical outcome and pain/ discomfort. The numerical rating score was also used to evaluate the patients' ability to chew and brush the recipient areas, and their dentin hypersensitivity. Before completing the questionnaires, each patient was instructed on how to differentiate between pain and discomfort related to the operated soft tissues and dentin hypersensitivity (characteristic of the exposed root surface). Patients were asked to verbally state a number between 0 (not satisfied or worse) and 10 (very satisfied or better) (Jensen *et al.*, 1986). The numerical rating score was recorded at 7, 14, 30, 90, and 180 days postoperatively. The occurrence of adverse effects and/or postoperative complications were registered.

The Oral Health Impact Profile-14 (OHIP-14) questionnaire proposed by Slade (1997) was used to assess the OHRQoL at baseline and after 90 and 180 days. This questionnaire is a tool that evaluate the individual's perception of the impact of oral disorders on their well-being, through the evaluation of seven dimensions: D1 (functional limitations), D2 (physical pain), D3 (psychologic discomfort), D4 (physical disability), D5 (psychologic disability), D6 (social disability) and D7 (handicap).

Each of the 7 dimensions consists of two questions, the answers are coded on a scale of 0 to 4, being: 0 "never," 1 "hardly ever," 2 "occasionally," 3 "fairly often," 4 "very often." The score obtained for each

question is multiplied by different weights, whose sum of each dimension varies between 0-4, which reflect the population's opinion on the importance of an item at the expense of its peer in each dimension (Slade, 1997). Thus, after this compensation, the value achieved in each dimension varies between 0-4, and the sum of the OHIP-14 total score between 0-28.

Statistical analysis

Descriptive statistics were used to synthesize the data recorded in the evaluations. Pearson's Correlation Coefficient was used to measure the association between OHIP-14 scores and percentage of root coverage. Analysis of variance (repeated measures ANOVA) and Friedman test were applied for comparing the other variables. The level of significance was 5% ($p < 0.05$).

Results

Of the 81 patients recruited for the study, 20 patients met the inclusion criteria resulting in a total of 83 gingival recession defects included in this study. Sample characteristics are shown on Table 1.

Mean percentage of root coverage after 90 and 180 days of the surgery was 62.25% and 61.77% respectively. Complete root coverage occurred in 7 teeth of 3 patients after 3 months, and in 9 teeth of 4 patients at 6 months postoperatively. Significant correlation was observed between percentage of root coverage and D2 of OHIP-14, after 90 days. Correlations between each dimension of OHIP-14 questionnaire and mean percentage of root coverage at 90 and 180 days are presented in Table 2.

Table 1. Data of patients included in the study.

Gender	Participants	Mean age (range)	Surgical area		GR (anterior teeth)		GR (posterior teeth)	
			Maxilla	Mandible	Maxilla	Mandible	Maxilla	Mandible
Female	12	38.91 (22-56)	7	5	17	7	18	9
Male	8	39.62 (32-47)	7	1	8	1	18	5
Total	20	39.22	14	6	25	8	36	14

GR = Gingival recession

Table 2. Correlation between OHIP-14 dimensions and root coverage after 90 and 180 days.

Evaluation time	Correlation	OHIP-14 dimensions							TOTAL SCORE
		D1	D2	D3	D4	D5	D6	D7	
90 days	r	0.27	0.38	0.01	0.14	-0.07	-0.01	-0.01	0.20
	p	0.16	0.04*	0.96	0.48	0.71	0.97	0.97	0.30
180 days	r	0.21	0.22	0.03	0.36	-0.24	-0.12	0.04	0.04
	p	0.28	0.24	0.87	0.06	0.20	0.54	0.82	0.85

r = Pearson's correlation coefficient; p = level of significance; * positive correlation

The comparison between OHIP-14 scores at baseline, 90 and 180 days after subepithelial connective tissue grafts showed significant improvement of D2 and D3. The OHIP-14 total score significantly improved from baseline to 90 and 180 days postoperatively (Table 3).

The quality of life parameters analyzed by numerical rating score at 7, 14, 30, 90 and 180 days are shown in table 4. There was significant improvement in chewing and brushing skills at 90 and 180 days postoperatively. Aesthetic, pain/discomfort and dentin hypersensitivity parameters were not significantly affected by subepithelial connective tissue grafts surgery.

However, dentin hypersensitivity was positively correlated with D2 and D4 of OHIP-14 at baseline, and D5 and D7 at 90 days. At 180 days, the reduction in dentin

hypersensitivity was positively correlated with changes in D1 and D2. Data regarding the correlation between OHIP-14 and hypersensitivity are shown in the table 5.

Discussion

This prospective clinical study demonstrated that root coverage with subepithelial connective tissue grafts plus coronally advanced flap procedures resulted in a positive impact on the quality of life of individuals with gingival recession up to 90 days postoperatively. OHIP-14 total score ranged from 4.30 to 1.11 at 90 days, and reached 1.25 after 180 days (Table 3). Data analysis also suggested that reduction in pain and psychological discomfort had significant impact on the improvement of adult patients' quality of life.

Table 3. Comparison between OHIP-14 dimensions at baseline, 90 and 180 days after SCTG.

Evaluation time	OHIP-14 dimensions							TOTAL SCORE
	D1	D2	D3	D4	D5	D6	D7	
Baseline	0.32 ^A	1.10 ^A	0.87 ^A	0.72 ^A	0.81 ^A	0.33 ^A	0.16 ^A	4.30 ^A
90 days	0.05 ^A	0.35 ^{A,B}	0.11 ^B	0.15 ^A	0.27 ^A	0.17 ^A	0.04 ^A	1.11 ^B
180 days	0.05 ^A	0.24 ^B	0.24 ^{A,B}	0.14 ^A	0.26 ^A	0.23 ^A	0.09 ^A	1.25 ^B

Different capital letters (A, B) in the same column correspond to the statistically significant difference ($p < 0.05$)

Table 4: Mean scores for the quality of life parameters analyzed by numerical rating score.

Parameters	Evaluation time					
	Baseline	7 days	14 days	30 days	90 days	180 days
Aesthetic	-	7.79 ^A	8.39 ^A	8.46 ^A	8.96 ^A	8.89 ^A
Pain / discomfort	-	7.04 ^A	7.18 ^A	7.89 ^A	8.68 ^A	8.43 ^A
Chewing ability	-	5.89 ^A	7.14 ^{A,B}	8.04 ^{A,B,C}	8.64 ^{B,C}	8.89 ^C
Brushing ability	-	6.46 ^A	7.14 ^{A,B}	8.04 ^{A,B,C}	8.64 ^{B,C}	8.89 ^C
Dentin Hypersensitivity	2.80 ^A	4.64 ^A	3.14 ^A	3.64 ^A	3.43 ^A	3.75 ^A

Different capital letters (A, B, C) in the same line correspond to the statistically significant difference ($p < 0.05$)

Table 5: Correlation between OHIP-14 dimensions and dentin hypersensitivity at baseline, 90 and 180 days after SCTG.

Evaluation time	Correlation	OHIP-14 dimensions							TOTAL SCORE
		D1	D2	D3	D4	D5	D6	D7	
Baseline	r	0.01	0.55	0.01	0.58	0.06	0.08	0.03	0.35
	p	0.95	0*	0.95	0*	0.73	0.64	0.84	0.06
90 days	r	0.05	0.11	0	0.36	0.41	0.35	0.39	0.32
	p	0.77	0.55	0.99	0.05	0.02*	0.05	0.03*	0.08
180 days	r	0.39	0.40	0.26	0.13	0.25	0.09	0.28	0.32
	p	0.03*	0.02*	0.16	0.49	0.17	0.64	0.13	0.08

r = Pearson's correlation coefficient; p = level of significance; * positive correlation

Gingival recession has been associated with reduced quality of life (Wagner *et al.*, 2016) and tends to progress over time, even in patients with adequate biofilm control (Chambrone and Tatakis, 2016). These observations justify the use of surgical procedures for treatment of gingival recession. Subepithelial connective tissue grafts associated with coronally advanced flap have shown satisfactory rates of root coverage (Chambrone *et al.*, 2018) for single and multiple gingival recession defects and was the option for the patients included in this study.

Although there is insufficient scientific evidence to conclude that surgical root coverage procedures reduce dentin hypersensitivity (Douglas de Oliveira *et al.*, 2013a; Cheng, 2015), OHRQoL can be improved after treatment of hypersensitivity (Douglas de Oliveira *et al.*, 2018). In general, there is limited literature available relating the impact of root coverage procedures on oral health-related quality of life. However, there is an increasing trend towards the development of patient-centered studies. A recent study evaluating whether different types of grafts (autogenous or xenogenic) can affect the quality of life (OHIP-14) after root coverage procedures demonstrated a significant improvement related to D2 at 7 days postoperatively (Tonetti *et al.*, 2018). Our data are in agreement with this finding.

In this study, quality of life, as assessed by OHIP-14 total score, demonstrated significant improvement when the baseline was compared to the other periods. These results are in agreement with other studies with up to 3 months of follow-up (Hansmeier and Eickholz, 2010; Douglas de Oliveira *et al.*, 2013b). However, there is no study with the same methodology of the present study, with evaluation period after 6 months, to confirm the maintenance of OHRQoL over time.

The differences observed between baseline and other postoperative times occurred in the D2 (180 days) and D3 (90 days) for the OHIP-14 total score. These results are in line with other studies (Douglas de Oliveira *et al.*, 2013b; Rocha Dos Santos *et al.*, 2017). However, in some studies the coronally advanced flap was used either with or without a xenogenic collagen matrix and/or enamel matrix derivative and these procedures all resulted in significant improvements of OHIP-14 scores in at 3 months postoperatively (Rocha Dos Santos *et al.*, 2017). In contrast to our study, the Rocha Dos Santos *et al.* (2017) study reported no correlation between OHIP-14 scores and percentage of root coverage. It is possible that the type of graft used is responsible for this difference, since the subepithelial connective tissue grafts have been reported to have higher rates of root coverage than other soft tissue substitutes (Atieh *et al.*, 2016).

The OHIP-14 scores related to physical pain (D2) presented improvement, probably due to a reduction of dentin hypersensitivity, which is in agreement with another study (Douglas de Oliveira *et al.*, 2013b) that

reported that dentin hypersensitivity is a causative factor of pain. The data collected from the correlation between OHIP-14 dimensions and dentin hypersensitivity suggest that at 180 days, the reduction in dentin hypersensitivity could be positively correlated with changes in D2.

The correlation data for the OHIP-14 scores and dentin hypersensitivity scores indicated that the presence of hypersensitivity interfered with patients' quality of life. These data are in agreement with Rocha Dos Santos *et al.* (2017) who also found a positive correlation between the D2 of OHIP-14 and hypersensitivity. On the other hand, Douglas de Oliveira *et al.* (2013a) observed a positive correlation only for D1 with hypersensitivity at 3 months postoperatively. These authors (Douglas de Oliveira *et al.*, 2013a) treated 22 patients who presented with 25 Miller class I gingival recession with subepithelial connective tissue grafts associated with coronally advanced flap. This study (Douglas de Oliveira *et al.*, 2013a) obtained 67.90% of root coverage after 3 months with complete root coverage in 11 cases. In our study, D5 and D7 but not D1 correlated with dentin hypersensitivity at 3 months postoperatively. These differences in results may be related to the sample profile, since our study included Miller classes I and II gingival recession s or Cairo's class RT1, and to methodological variations.

The presence of an adequate width of keratinized gingiva around teeth and implants has been related to better control of oral hygiene since it allows more comfortable and less painful chewing and brushing (Kim and Neiva, 2015; Berglundh *et al.*, 2018). The significant differences in chewing and brushing abilities confirmed by the comparison of data collected by the numerical rating score during the studied periods suggests that this improvement may be related to the degree of root coverage achieved by the surgical procedure.

Some of the limitations of this longitudinal study are the short period of evaluation (180 days), inclusion of gingival recession in both arches, anterior and posterior region and relative subjectivity of sensitivity assessment. However, the major strength of this study is the demonstration of the positive impact of subepithelial connective tissue grafts for root coverage in patients' quality of life. Randomized clinical trials with longer periods of evaluation (12 and 24 months) and the relation of other surgical techniques and quality of life should be considered to reach more evidence-based conclusions.

CONCLUSIONS

Root coverage procedures with subepithelial connective tissue grafts plus coronally advanced flap improved the OHRQoL of adult patients with gingival recession. This result was attributed to a decrease in pain and psychological discomfort, and to the improvement of chewing and brushing abilities noted mainly after 180 postoperative days.

ACKNOWLEDGMENTS AND CONFLICT OF INTEREST

The authors report no conflicts of interest related to this study.

SOURCES OF FUNDING STATEMENT

The study was supported by the Department of Prosthodontics and Periodontics of Bauru School of Dentistry at University of Sao Paulo in Bauru, the Brazil. This study was financed in part by the Coordination for the Improvement of Higher Education Personnel, CAPES [Finance Code 001].

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