

Original Article

Impact of One-Stage Full Mouth Disinfection and Periodontal Surgery on Oral Health-Related Quality of Life

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ABSTRACT

Statement of the Problem: Information on patient-centered outcomes of periodontal disease and the impact of different periodontal treatment phases on the life quality of periodontal patients is limited.

Purpose: This study sought to compare patients' perception of their oral health-related quality of life (OHQoL) following one-stage full mouth disinfection (OSFMD) and surgical periodontal treatment.

Materials and Method: A single group, two-phase, pre-and post-interventional study design was used. Subjects were recruited from moderate to severe chronic periodontitis patients referred to a private clinic. At baseline and after each treatment phase, periodontal parameters were recorded by a blind examiner. Patients received OSFMD, followed by periodontal flap surgeries and completed the validated Iranian version of the OHIP-49 questionnaire (OHIP-35-IR) at three time points (baseline, two weeks post-initial therapy and after completion of surgical phase). Data were analyzed using repeated measure ANOVA, paired and independent t-tests, and multivariate regression analysis by SPSS software version 21.

Results: 38 patients (14 men, 24 women, mean age 40.30±11.93) completed the study. Periodontal parameters showed progressive improvement from baseline to the end of the study ($p<0.05$). The total mean OHIP-35-IR score at baseline (89.25±19.26) was significantly improved (reduced) compared to each treatment phase (75.63±17.15 and 74.22±15.46, respectively; $p<0.001$), with no significant difference between treatments. Improvements in subdomains of psychological discomfort, functional limitation, physical pain, and handicap accounted for the changes. The effect size was calculated to be 0.80 for the first and 0.66 for the second treatment phases.

Conclusion: Within limits, OSFMD and periodontal surgical treatment have positive impacts on the OHQoL of patients. Intensive periodontal non-surgical treatment is as effective as surgical intervention for achieving desirable patient-centered outcomes.

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Introduction

Objective measures of periodontal disease provide little information on patients' perspective of their disease and the impact of treatment on well-being and quality of life (QoL). Despite well-established evidence on periodontal

treatment effectiveness [1-3], existing literature suggests a weak correlation between clinical assessment of oral health by clinicians and patients' perception of their pre- or post-treatment oral health status. [4-5] Drawing on the importance of periodontal care in society, biopsy-

chosocial approach to periodontal interventions is gaining more attention by professionals aiming at approximating patient-based outcomes with clinical end points of successful treatment to accomplish a holistic evaluation of oral health [6-7].

“Health” is declared by the World Health Organization (WHO), as "A state of complete physical, mental, and social well-being not merely the absence of disease . . .". Therefore, measuring QoL is integral to the process of determining health status for individuals and the effects of health care in the societies. In light of the myriad factors that define QoL for any individual, such as physical health, social interactions, and psychological state, assessment of oral health and QoL issues has become the subject of interest in dental healthcare settings over the past fifteen or so years. However, the need to assess the effect of periodontal treatment on QoL is still present.

Oral health-related quality of life (OHRQoL) is a relatively new yet emerging notion in periodontology [4-5, 8]. Among different approaches to measure OHRQoL, multiple item questionnaire of the OHRQoL, the Oral Health Impact Profile (OHIP), and the Oral Impacts on Daily Performance (OIDP) have been frequently used. [9-11] OHRQoL questionnaire evaluates four main aspects, including functional limitation, pain and discomfort, psychological factors, and social factors. Whereas, oral health impact profile (OHIP-49) questionnaire indicates the relationship of OHRQoL with health and disease. The OHIP-49 and its short version (OHIP-14), are recognized as good predictors of psychological well-being and life satisfaction across different oral pathologic conditions requiring treatment and/or rehabilitation [10,12-13]. Despite advances in patient-centered outcome evaluation in periodontal care, the impact of comprehensive non-surgical treatments such as one-stage full mouth disinfection (OSFMD), or surgical pocket therapy on OHRQoL has not been established adequately. The present study set out to assess and compare the effects of OSFMD and surgical periodontal therapy on the OHRQoL of patients with moderate to severe chronic periodontitis. We believe that this is the first work to investigate and compare patient-centered outcomes of periodontal treatments using the Iranian version of the OHIP-49 questionnaire.

Materials and Method

Subjects and study design

38 patients with generalized moderate to severe chronic periodontitis participated in this one group, two-stage, pre-and post-interventional study. The research project was approved by the Ethics Committee of Guilan University of Medical Sciences (GUMS) and adhered to the Declaration of Helsinki guidelines. This study was conducted between May 2015 and March 2016 in a private periodontal clinic, Rasht, Iran. In a previous study by Makino-Oi *et al.* [14], 26 and 50 patients in each treatment arm (non-surgical and surgical respectively), provided 80% power to discover a difference of 4.6 and 7.0 in the mean score of OHRQoL with a 95% confidence level. Accordingly, a total of 38 patients comprised our study population. Upon entry, all the participants signed an informed consent.

Inclusion criteria were a diagnosis of generalized moderate to severe chronic periodontitis [15], and having at least 20 standing teeth. The exclusion criteria were a history of periodontal treatment 6 months prior to entry, taking any medication known to affect periodontal tissues, taking anti-depressant, anti-anxiety, anti-inflammatory, and immunosuppressive medications, uncontrolled diabetes, pregnancy or lactation, heavy smoking (>10 cigarettes/day) and needing antibiotic prophylaxis.

Clinical parameters including probing pocket depth (PPD), and clinical attachment level (CAL) were recorded at six sites per each tooth as well as bleeding on probing (BOP) using Lenox & Kopczyk index [16], at baseline, and after completion of non-surgical (phase I), and surgical (phase II) periodontal treatments by a calibrated examiner. Data on sociodemographic characteristics, such as age, gender, smoking habits, educational level, and socio-economic status (family income), were also collected.

At baseline, all patients received standard oral hygiene instructions (OHI). This included inter-dental plaque control (by dental floss and/or interdental brushes), tooth brushing, and brushing of the tongue dorsum once a day.

A single periodontist performed the initial periodontal treatment, comprised of OSFMD according to Quirynen *et al.* [17]. The OSFMD protocol constitutes completion of scaling and root planning (SRP) within 2

consecutive days, use of an antiseptic (0.2% Chlorhexidine was used in this study) for intra-pocket irrigation (chairside), and oral rinse (home use for 2 weeks), and regular brushing of the tongue. After a 3-week interval for tissue healing, a re-evaluation was performed based on which, a further surgical treatment plan was formulated and discussed with patients. Surgical phase started 6-8 weeks after initial treatment and comprised of flap debridement with minor osseous surgery on a quadrant basis over single or multiple treatment episodes, according to patient's treatment needs. In case of multiple sessions, a minimum of 2-week interval was considered. All the participants responded to the OHIP-35-IR questionnaire under the supervision of a trained dentist at baseline, two weeks after SRP, and approximately 6 weeks after the final surgery.

Assessment tool

The original OHIP (OHIP-49) is a multidimensional construct that reflects impairment in several aspects of daily living related to oral health [10]. These include functional limitation (e.g., difficulty chewing); physical pain (pain in mouth and discomfort eating foods); psychological discomfort (feeling self-conscious and tense); physical disability (interrupted meals and unsatisfactory diet); psychological disability (difficulty in relaxing and embarrassment); social disability (avoiding social interaction); and handicap (inability to function). It has been indicated that OHIP-49, is reliable [18-19], sensitive to changes [20], and show suitable cross-cultural consistency [9]. Its simplified Persian version (OPI-14) has been adapted to use among Iranian subjects with good validity and reliability.

Translation process: The English version of the OHIP-49 questionnaire was translated into Persian by a native Persian translator with sufficient proficiency in English language and experienced in questionnaire translating. Then, the questionnaire was back-translated from Persian to English by two professional translators. In addition, the English version of the OHIP-49 questionnaire was translated into Persian by two university professors. Then, the translators and professors both checked the translations and agreed upon the final Persian version.

Validity and reliability assessment: Content validity ratio (CVR) and content validity index (CVI) were assessed. For CVR, 10 dental school professors scored

each question using a three-point scale, comprising "it is necessary", "it is useful, but not necessary", and "it is not necessary". For CVI, same assigned professors marked each question in terms of simplicity and fluency, and explicitly. All questions with CVR less than 62% or CVI less than 70% were excluded from the questionnaire and the resultant Iranian version of the OHIP-49 with 35 questions (OHIP-35-IR) was used in the present study. For reliability assessment, a pilot study was performed and 15 patients with moderate to severe chronic periodontitis completed the OHIP-35-IR twice with a three-week interval. The appropriateness of items regarding their meaning and difficulty, in addition to instructions for conducting the test, were assessed during this process. The suggested changes were implemented with the help of assigned university professors who were experts in the field. Moreover, interclass correlation coefficient (ICC) for each domain was calculated which ranged from 0.833 for physical disability to 0.995 for physical pain.

In the main study, respondents answered the questions on a 5-point Likert scale (1, never; 2, hardly ever; 3, occasionally; 4, fairly often; and 5, very often). The additive OHIP-35-IR score for each participant was characterized by the sum of the subdomain scores, according to the recommendation of John *et al.* [21], and a score range of 35 to 175 was obtained. A lower total score represented less, a higher score, more impaired OHRQoL.

Statistical analysis

Descriptive statistics are presented as arithmetic mean and standard deviation for the OHIP-35-IR scores. For the evaluation of OHIP-35-IR, both the total score and individual domain scores were used. OHRQoL was the primary outcome. After determining the normality of data distribution via a Kolmogorov-Smirnov test, the statistical significance of the differences in periodontal parameters as well as the differences in mean scores of each OHIP-35-IR domain between pre- and post-treatment were compared using independent and paired t-tests respectively. Repeated Measures ANOVA Greenhouse-Geisser tests were applied to investigate the trends of total differences in the OHIP-35-IR domains. The effect size was calculated for the OHIP-35-IR and its domains using omega squared (ω^2). To evaluate the effect of demographic and periodontal variables on the

Table 1: Demographic characteristics of the sample (N=38) and their significance upon the OHIP-35-IR score over the time

Variable	Measurements	P*	P**
Age (years), mean \pm SD (range)	40.3 \pm 11.9 (18-60)	0.23	0.61
Sex, n (%)			
Females	24(63.2)	0.07	0.33
Males	14(36.8)	0.12	0.29
Monthly income			
Low, Middle, High(Toman) [†]	0/17/21	-	-
Smoking, n (%)			
Smokers	5(13.1)	-	-
Non-smokers	33(86.9)	-	-
Educational level (%)			
BD/Diploma/AD [‡] , n (%)	0/9(23.6)/29(76.3)	-	-
PPD	3.68 \pm 1.4	0.07	-
CAL	4.51 \pm 1.5	0.28	-
BI (%)	76.14 \pm 18.75	0.05	0.03

[†] Low:900000, Middle:900000-3000000, High:>3000000 Toman: Iranian currency
[‡]Below High School Diploma(BD), Above High School Diploma(AD)
*Non-adjusted linear model
**Multivariate model adjusted for age, gender, and periodontal variables

change of the OHIP-35-IR score over time, a linear mixed model was applied and those variables with p value <0.1 were introduced into a multivariate model. In this study p values ≤ 0.05 were assumed statistically significant. All analyses were performed using SPSS (Version 21, IBM SPSS, Chicago, IL, USA).

Results

Of 40 participants, two patients refused further treatment (overall non-response rate of 5%, $n=2$), due to considerable improvement of symptoms, yielding a final sample of 38 adults with mean age of 40.3 ± 11.9 , comprised of 24 females, and 14 males. 33 were non-smokers (86.9%), 17 (44.7%) were categorized as having a middle socioeconomic status, and 29 (76.3%) were considered to have a high educational level (Table 1).

Table 2 shows mean and standard deviation for the OHIP-35 and its domains after periodontal treatment

compared to baseline. At the end of phase I and phase II, total OHIP-35 scores were significantly lower (better) than baseline. At baseline, the psychological discomfort (19.06 ± 4.94) and social disability (7.50 ± 4.53) domains showed the highest and lowest scores, respectively. The means of functional limitation, physical pain, psychological discomfort, and handicap domains after phase I and II of the study were significantly lower than baseline. Statistically significant differences in means of physical disability, psychological disability, and social disability domains were not observed either between periodontal treatment phases or between interventions and baseline. Repeated measures ANOVA and Greenhouse-Geisser tests revealed a decreasing trend (improvement) in the OHIP-35-IR means from baseline towards the end of periodontal treatment phases. Similar inclination in means was observed for 5 out of 7 domains. Physical disability and social disability domains

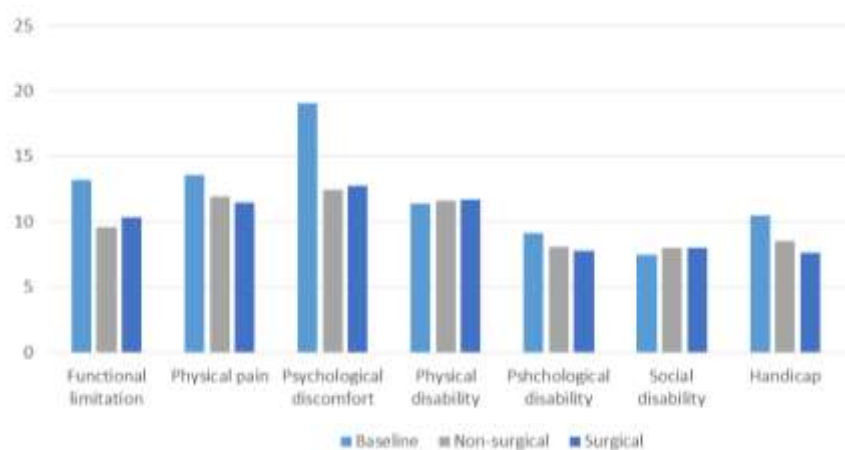
**Figure 1:** OHIP-35 subscales: Comparison of means at baseline, post non-surgical, and post-surgical treatments

Table 2: Comparison of mean and SD of OHIP-35-IR subdomains at baseline, phase I, and phase II

OHIP- 35 Subscales	Baseline (N=38)		Phase I(N=38)		Phase II (N=38)		p value*		
	Mean	SD	Mean	SD	Mean	SD	Baseline/Phase I	Phase I/II	Baseline/Phase II
Functional limitation	13.23	3.11	9.62	3.70	10.32	3.55	<0.001	0.146	<0.001
Physical pain	13.54	4.01	11.93	3.04	11.43	3.34	0.01	0.42	0.002
Psychological discomfort	19.06	4.94	12.42	5.73	12.77	6.07	<0.001	0.37	<0.001
Physical disability	11.36	3.65	11.65	2.74	11.72	2.44	0.56	0.67	0.15
Psychological disability	9.13	4.84	8.06	3.49	7.75	2.79	0.58	0.20	0.22
Social disability	7.50	4.53	8.01	3.76	8.01	3.76	0.53	0.99	0.50
Handicap	10.49	4.45	8.53	2.83	7.65	2.95	0.01	0.13	0.001
Total score	89.25	19.26	75.63	17.15	74.22	15.46	<0.001	0.66	0.001

*Repeated measures ANOVA and Greenhouse-Geisser test

showed increasing drift (Figure 1).

Table 3 indicates the effect size (ES) of assigned periodontal treatments on OHRQoL. Psychological discomfort domain revealed the greatest improvement after non-surgical and surgical treatments, followed by functional limitation, pain, and handicap domains. Other domains (physical, psychological, and social disability) did not show significant ESs post treatment. Overall, periodontal treatment modalities brought about large improvement after non-surgical treatment (ES: 0.803), and moderate after surgical treatment (ES: 0.661), in the OHRQoL of the patients compared to baseline. We did not observe ceiling and floor effects in this study.

There were no significant correlations between changes in the OHIP-35-IR and periodontal variables or patients' demographics in the multivariate model except for BI. Bleeding on probing was associated with changes in the OHIP scores both in the non-adjusted linear and adjusted multivariate models (Table 1).

Statistically significant improvement in all periodontal parameters was disclosed following non-surgical and surgical treatments compared to baseline (P<0.001, data not shown).

Discussion

The present study was performed to investigate the

Table 3: OHIP (total and subscales) change score and effect size (n=38)

OHIP		Change score		P value	Effect size (ω^2) *	Effect size threshold**
		Mean	SD			
Functional limitation	BL [†] to P I [‡]	3.55	3.81	<0.001	0.926	Large
	BL to P II [§]	2.73	3.01	<0.001	0.786	Moderate
	P I to II	-1.27	4.62	0.1	0.264	small
Physical pain	BL to P I	1.61	3.70	0.01	0.433	Moderate
	BL to P II	2.33	3.65	0.002	0.612	Moderate
	P I to II	0.38	2.51	0.4	0.144	Small
Psychological discomfort	BL to P I	6.63	5.74	<0.001	1.162	Large
	BL to P II	6.00	6.74	<0.001	0.895	Large
	P I to II	-1.05	6.32	0.3	0.16	Small
Physical disability	BL to P I	-0.36	3.25	0.5	0.094	Small
	BL to P II	-1.00	4.03	0.1	0.256	small
	P I to II	-0.36	3.63	0.6	0.076	Small
Psychological disability	BL to P I	0.48	4.41	0.6	0.089	Small
	BL to P II	1.03	4.51	0.2	0.217	small
	P I to II	0.95	4.12	0.2	0.228	small
Social disability	BL to P I	-0.55	5.14	0.5	0.102	Small
	BL to P II	-0.55	5.14	0.534	0.102	Small
	P I to II	0.00	0.00	0.9	0.000	Small
Handicap	BL to P I	1.76	4.13	0.01	0.424	Moderate
	BL to P II	2.51	4.05	0.001	0.626	Moderate
	P I to II	0.87	3.01	0.1	0.273	small
OHIP-35	BL to P I	13.64	16.80	<0.001	0.803	Large
	BL to P II	12.25	18.91	0.001	0.661	Moderate
	P I to II	-1.46	17.50	0.6	0.079	Small

*Omega squared

**small (≤ 0.2), moderate (0.3–0.7) or large (≥ 0.8) effect [Cohen (36)][†]BL: Baseline, [‡]Phase one, [§]Phase two

impact of surgical and non-surgical (OSFMD) periodontal therapy on OHRQoL in patients with generalized moderate to severe chronic periodontitis. We found significant improvement in patients' perceived quality of life related to their oral health shortly after receiving periodontal non-surgical/surgical treatments which supported the notion that periodontal status influences patients' social, physical, and psychological functioning. We observed a decreasing trend in the mean OHIP-35-IR scores from 89.25 ± 19.26 at baseline to 75.63 ± 17.15 after non-surgical and 74.22 ± 15.46 after surgical treatments towards the end of the study. Improvements in subdomains of psychological discomfort, functional limitation, physical pain and handicap accounted for the changes. These results are in accordance with previous studies showing not only periodontal patients experienced reduced OHRQoL, but also most important, that appropriate treatment yielded significant improvement in their perceived equality of life [5, 8, 22-25].

Many previous studies have utilized the short version of the OHIP-49 (OHIP-14) to measure OHRQoL of periodontal, restorative, prosthodontic patients and reported different levels of improvement in the OHRQoL in these patients [5-6, 12-13]. However, to the best of our knowledge, this is the first to investigate short-term changes in patients' QoL after OSFMD treatment and surgical intervention.

We observed profound improvement in clinical parameters following OSFMD treatment including pocket depth reduction, clinical attachment level gain, and reduction in bleeding scores in both moderate and deep pockets. Efficacy of periodontal non-surgical treatments has been well established in the literature. In a recent systematic review and meta-analysis, Mailoa *et al.* [26], reported that periodontal debridement combined with regular maintenance is a viable and predictable treatment for maintaining attachment level in most diseased sites with initial moderate (4-6 mm) pocket depth. Positive clinical outcomes following OSFMD in our study may be approached from patients' perspective through the resultant large ES (0.803) on the OHRQoL. Our findings corroborate those of Mendez *et al.* [24], and Saito *et al.* [23], who observed effect sizes of 0.74 and 0.8 after scaling and root planning using OHIP-14.

Shanbhag *et al.* [4], in a systematic review of the impact of non-surgical periodontal treatment on

OHRQoL in adults reported moderate improvement (ES ranging from 0.27 to 0.8), in short-term (one week) and long-term (one year) periods which is in line with the findings of the present study.

When the OHIP--35 scores were analyzed, psychological discomfort, pain, and functional limitation were the most impaired subdomains at baseline. Moreover, following periodontal intervention, these subdomains showed similar trend of improvement in the mean scores with that of the total score (Figure 1). This finding supports previous results by Wong *et al.* [27], and Makino-Oi *et al.* [14], who observed improvements in similar domains following non-surgical and surgical periodontal treatments respectively. It is anticipated that the more weakened domains show higher possibility of improvement and therefore, higher affect size after periodontal treatment.

We observed that surgery did not provide further significant improvement in the total OHRQL score over phase I which is in accordance with Saito *et al.* [25], Ozelik *et al.* [22], and Makino-Oi *et al.* [14]. This may have several explanations. First, subgingival debridement is regarded the gold standard for successful periodontal treatment. [1-3] Patients experience remarkable changes as many symptoms subside following resolution of inflammation including bleeding, swelling, color and texture of gingiva, malodor, pain, difficulty in chewing, and tooth mobility. [28] However, patients seem to adhere better to short-term periodontal treatment schemes. OSFMD is a time-reduced, cost-effective treatment option. Procedure is aimed at eliminating plaque and/or calculus from teeth and other oral microbial niches such as tongue and tonsils, by means of combined mechanical and chemical procedures to achieve full-mouth disinfection within a 24-hour period. Secondly, it might be claimed that periodontal surgery is a subsidiary treatment option after receiving non-surgical treatment. Since OHRQoL scores after initial therapy were already improved to the extent that any further amelioration would not be significantly reflected after surgery. Third, different periodontal treatment modalities may affect patients' state of mind due to immediate post-procedural symptoms such as pain, swelling, and discomfort in chewing, speaking, and maintaining routine oral hygiene. These in turn may delineate overall satisfaction of the treatment provided and affect

long-term sense of well-being and QoL related to surgical versus non-surgical treatments [22, 29].

The current study however, is in contradiction with findings of Chou *et al.* [30] Authors reported an effect size of 0.79 for change scores from post-initial therapy to post-surgery. This value was 0.07 in our study and 0.2 in a study by Saito *et al.* [25] Makino-Oi *et al.* [14] also noted small ES on same subject. In their study, Chou *et al.* [30], not only reported a higher ES for surgical over non-surgical intervention, but also compared the impact of regenerative (RG) versus resective (RS) periodontal surgery on QoL of patients with chronic periodontitis and reported better outcomes for RG surgery in all subdomains except for social disability. It is noteworthy that periodontal resective surgery implemented in our study, resulted comparable amount of improvement in functional limitation, psychological discomfort, and handicap items with that of regenerative surgery reported by Chou *et al.* [30]

One notable finding was that improvement in OHIP score after periodontal treatment was correlated with changes in BOP values. It may be proposed that bleeding is an objective sign of periodontal disease and is highly perceptible for patients. Previous studies found weak correlation between changes in PPD and CAL with OHRQoL after periodontal surgery [14, 22]. This may have an implication for future research to include not only PPD, BOP, and CAL, but also more tangible parameters of periodontal disease such as marginal tissue recession, and tooth mobility.

Our study has several limitations that need to be discussed. Our sample included 38 adults requiring complete periodontal treatment package (initial, surgical, supportive treatments). Ethical considerations prompted us not to include a control group to receive solely non-surgical treatment during the study period (delaying of a potentially effective treatment). On the other hand, all patients received antibiotics and analgesics after periodontal surgery, so the actual effects of surgical treatment may have been partly hidden. Another limitation is the use of a single instrument for assessing outcome variable. QoL is multifactorial in nature. As such, applying multiple instruments and capturing different aspects of patients' QoL, may lead to more comprehensive evidence.

Despite these limitations, our study adds pertinent

data to the limited literature examining the impact of different periodontal treatment modalities on OHRQoL.

Pre-post-interventional study design has the strength of temporality to be able to suggest that patients' OHRQoL is impacted by periodontal treatment. In addition, both treatment arms were delivered to the same subjects, which eliminated individual differences in the subjective assessment of QoL and making comparison of the outcome more reliable. Moreover, we used strong criteria for selecting moderate to severe periodontal cases. We standardized types of non-surgical and surgical treatments through deliberate case selection. Furthermore, one single periodontist performed all treatment phases, which eliminates any possible bias pertaining to the relationship between clinician's experience and patient perceptions. [22]

Conclusion

Within limits, our findings indicate that both OSFMD and surgical periodontal treatments can improve patients' QoL, particularly regarding functional limitation, psychological discomfort, and physical pain. Despite tendency of periodontal surgery to establish an improvement in oral health-related QoL, scores at post-initial therapy and post-surgery intervals, were not statistically different. This study contributes to the important step on the way to successful periodontal treatment regarding patients' comfort, function, and positive sense of welfare. Future multicenter, longitudinal studies that collect more information on potential confounders are needed.

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Conflict of Interest

None declared.

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