# Patient-related Evaluation After Systematic Periodontal Therapy – A Clinical Study on Periodontal Health-related Quality of Life (PHQoL)

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**Purpose:** To evaluate how periodontitis patients perceive the outcome after long-term supportive therapy.

**Materials and Methods:** 281 patients (150 women/131 men) with a mean age of 55 years (range: 45–86 years) were randomly selected and consecutively interviewed using a questionnaire designed for laypersons. All patients had shown high compliance with the recommended supportive periodontal therapy (SPT) for up to 16 years (mean observation period: 12.5 years). Statistical evaluation was performed using the 2-sided t-test.

**Results:** A very high degree of confidence in the periodontal treatment (mean: 9.24, range 0–10) was found. Women noticed a higher positive impact on their social environment ($p < 0.05$). Patients who underwent SPT < 3 years showed a higher positive perception of treatment success than patients with SPT > 3 years ($p < 0.01$) and reported a greater impact on appearance ($p < 0.01$). Regenerative treatment demonstrated advantages over resective open flap debridement (OFD) procedures ($p < 0.05$) and scaling and root planing (SRP) ($p < 0.05$). However, treatment costs ($p < 0.001$) and time required ($p < 0.01$) for regenerative procedures were perceived as a burden. Periodontal treatment by a specialised team led to a significant reduction in the patients' complaints ($p < 0.01$). The SPT interval did not influence patients' perception of treatment success.

**Conclusions:** Systematic periodontal therapy with subsequent SPT met the patients' demand to preserve oral health. Regenerative procedures prompt the perception in patients of better remission of periodontitis symptoms. Further trials should investigate clinical results of periodontal therapy regarding patient expectations.

**Key words:** compliance, lifestyle, long-term maintenance, patients' perception, Periodontal Health Quality of Life (PHQoL), regenerative therapy

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Periodontitis remains a major public health issue (Tonetti et al, 2011) and the progression of the disease is linked to biological as well as social and behavioural factors. An increased severity of chronic periodontitis is associated with, for example, a low level of education, smoking, diabetes (Axelsson et al, 1998; Leung et al, 2006) and obesity (Al-Zaharani et al, 2003; Alabdulkarim et al, 2005; Suvan et al, 2011). Long-term success of systematic periodontal therapy has been well documented in multiple studies. The clinical studies fundamentally refer to measurable medical parameters, such as periodontal probing depth (PPD), probing attachment level (PAL), bleeding on probing (BOP), furcation involvement (FI) and tooth mobility (TM). Periodontal treatment can be performed non-surgically or surgically, either with or without regenerative procedures. Non-surgical procedures have a higher risk of leaving deposits of plaque and calculus in pocket probing depths > 5 mm (Waerhaug et al, 1978) compared to open flap procedures, especially in molars (Buchanan and Robertson, 1987), irrespective of the performed treatment method (Badersten et al, 1981; Wennstrom et al, 2005; Christgau et al, 2006). The amount of calculus removal by scaling and root planing (SRP) depends on the extent of disease, anatomic factors and the operator's skills (Waerhaug et al, 1978). However, despite success-

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ful SRP and compliance of the patient, localised sites such as teeth with furcation involvement have a higher risk for recolonisation of a pathogenic subgingival microflora and a rebound of the periodontal disease (Beikler et al, 2004). Furthermore, the reduction of periodontal probing depth (PPD) and the outcome of PAL gain following SRP must be critically assessed, due to the fact that PPD reduction does not necessarily indicate the formation of a new connective tissue attachment.

In the late 1990s, a new approach to periodontal regeneration was presented: by the use of derivative of enamel matrix proteins (Hammarström 1997; Heijl et al, 1997), a significant amount of new connective tissue attachment could be achieved (Nyman et al, 1982; Bowers et al, 1989; Sculean et al, 1997). The combination of barrier membranes and grafting materials may result in histological evidence of periodontal regeneration, predominantly bone repair (Sculean et al, 2005, 2008). Especially long-term maintenance by regular subgingival biofilm removal and supragingival plaque control sustains the clinical situation and periodontal health after systemic periodontal treatment (Nyman et al, 1986, 1988; Mombelli et al, 1995). However, there is only limited data on patients' awareness of their individual quality of life changes after periodontal treatment.

The aim of this study was to evaluate patients' perception of success after systematic treatment of chronic periodontitis (CP) and during on-going supportive periodontal therapy (SPT). Valuable information on individual well-being, social environment, oral health, performance, habits and esthetics, as measured by pain as well as by financial and time expenditure and their related factors were investigated.

## MATERIALS AND METHODS

### *Study group and procedures*

A cohort of 281 patients (150 women/131 men) with a mean age of 55 years (range: 45–86 years) was evaluated. Randomisation was performed using an arbitrary time frame of 4 months during the continuing maintenance programme performed in a private periodontal practice (Aachen, Germany). Over 700 patients per year are enrolled in this maintenance programme.

The inclusion criteria were as follows: only patients with a history of treated chronic periodontitis (CP); treatment had to have been completed for more than one year before investigation; only patients with compliance over the period of supportive periodontal therapy. Complete periodontal assessment including number of teeth, periodontal probing depth (PPD), bleeding on probing (BOP), recessions, furcation involvement, tooth mobility as well as complete sets of periapical radiographs at baseline ($T_0$), at one year after surgical therapy ($T_1$) and during SPT ($T_2$), according to individual SPT protocol were required. Each patient gave formal agreement to be included in the study. Adequate knowledge of the German language for correct answers was a prerequisite.

Only patients who showed adequate compliance during periodontal therapy and maintenance period were included. Furthermore, they were divided into two compliance groups. Compliance was defined as C1 and C2. C1: patient attended SPT as advised at any time during the observation period; C2: patient undergoing SPT missed at least one appointment in at least one year of systematic SPT, but did not let more than one year go by without making and attending a new appointment. Patients undergoing SPT who failed to attend more than two advised appointments over a period of more than two years were excluded (C0).

A questionnaire designed for laypersons was used (Fig 1 and Table 1). The patients answered ten questions on a numerical scale from 0 to 10 followed by an anonymous evaluation of the questionnaires by descriptive statistics and significance testing. 280 patients agreed to be included in the study, 262 questionnaires were completed, included and statistically evaluated, 18 questionnaires were discarded because of incomplete responses to the questions.

### *Analysis of data*

The statistical analyses were conducted using the Statistical Package for Social Sciences (SPSS, Version 19; Chicago, IL, USA). As statistical procedures, the Pearson product-moment correlation coefficient for testing the association between metric variables and Student's t-test for comparing means (2-sided tests, $\alpha = 5\%$) were used.

Parametric statistics were used because the sample size was sufficient and we preferred to report means instead of mean ranks. To confirm this statistical approach, the corresponding non-para-

| Table 1 Questionnaire attachment | | |
|---|---|---|
| **Age (years)** | | |
| **Gender** | ❑ male | ❑ female |
| **Surgical therapy (date)** | | |
| **Open flap debridement (OFD)** | ❑ yes | ❑ No |
| **Regenerative therapy** | ❑ yes | ❑ No |
| **Individual SPT protocol** | ❑ 3 months | ❑ 6 months |
| **Referred patient** | ❑ yes | ❑ No |

metric Mann-Whitney U-Test and nonparametric correlation were conducted with similar results.

### *Ethical aspects*

Verbal and written information related to participation in the present study was given to all potential participants before distributing the questionnaire. Requirements regarding informed consent and confidentiality were fulfilled. If requested by any participant, instructions to fill out the form were given by impartial colleagues. The questionnaires were analysed by an anonymous examiner who was not involved in the treatment of the patients nor did the patient have any personal knowledge of the examiner.

## RESULTS

The surveyed patients showed a very high degree of confidence in the periodontal treatment (mean: 9.24) and felt very satisfied (mean: 8.85, Fig 2). Women noticed a higher positive impact on their social environment than did men ($p < 0.05$, Fig 5). Patients given SPT for < 3 years showed higher positive perception of treatment success than did patients given SPT >3 years ($p < 0.01$). They also appreciated a higher impact on their appearance ($p < 0.01$, Fig 4). The type of periodontal surgery performed determined the impact on the patients' perception of oral health in terms of bleeding gums, oral malodour and discomfort. Regenerative periodontal surgery led to better remission of symptoms compared to resective open flap debridement procedure (OFD) ($p < 0.05$, Fig 3) and SRP ($p < 0.05$, Fig 3). However, financial ($p < 0.001$) and time expenditures ($p < 0.01$) in the context of regenerative procedures are perceived as a burden. Periodontal

Questionnaire

1) How do you feel after systematic periodontal treatment?
unsatisfied — no change — satisfied

2) How do you judge the effect of performed treatment concerning your social environment?
negative change — no change — positive change

3) How do you judge the effect of performed treatment concerning the remission of symptoms such as bleeding, malodour or toothache?
consistent — improvement — worsening

4) How do you judge the effect of performed treatment concerning your general physical status?
worsening — no change — improvement

5) How do you judge the effect of performed treatment on your appearance?
negative change — no change — positive change

6) How do you judge the effect of performed treatment on your lifestyle such as smoking or nutrition?
negative change — no change — positive change

7) How do you judge the supportive periodontal therapy (SPT) after surgery?
inappropriate — appropriate

8) How do you feel after systematic periodontal therapy (including initial anti-inflammatory therapy and surgical therapy) concerning
- temporal burden
negative effect — positive effect
- financial burden
negative effect — positive effect
- pain
negative effect — positive effect

9) How do you feel during supportive periodontal treatment (SPT) concerning
- temporal burden
negative effect — positive effect
- financial burden
negative effect — positive effect
- pain
negative effect — positive effect

10) Would you recommend the received periodontal treatment to your family and friends?
no recommendation — recommendation

**Fig 1** Questionnaire.

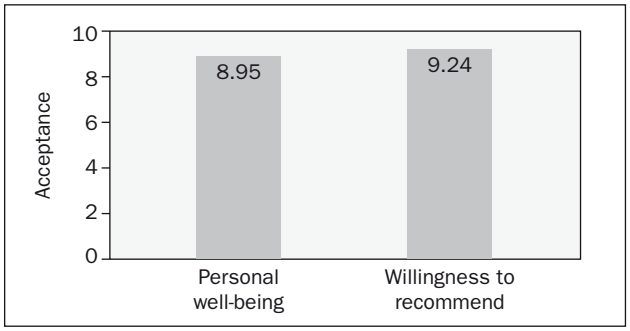


**Fig 2** Patient-specific assessment of their personal well-being and willingness to recommend.

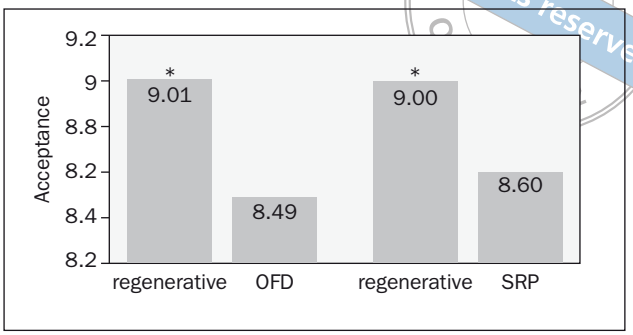


**Fig 3** Effect of performed surgical technique on the patients' perception of oral health: significant improvement after regenerative procedures in comparison to resective OFD procedures ($p = 0.032$) and SRP ($p = 0.027$). *Significant at $p < 0.05$.

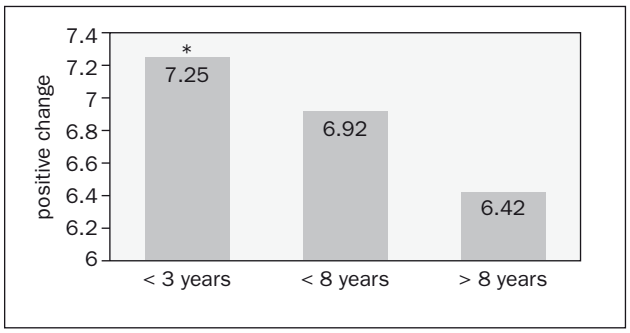


**Fig 4** Effect of duration of SPT on the patients' esthetic perception: significant higher positive perception of esthetic improvement at SPT duration of less than 3 years ($p = 0.041$).

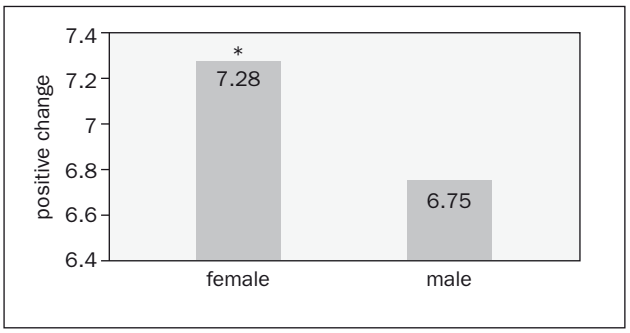


**Fig 5** Effect of performed treatment on patients' perception concerning their social environment: significant higher positive perception in female patients ($p = 0.036$).

treatment in the hands of a specialised team led to a significant reduction in the patients' complaints ($p < 0.01$). No influence of varying SPT intervals was found.

## DISCUSSION

The long-term success of periodontal therapy is well documented in several studies concerning SRP and OFD or regenerative periodontal procedures (Pontoriero et al, 1999; Cortellini and Tonetti 2011). Clinical studies fundamentally refer to measurable medical parameters as PPD, PAL, Rec, and TM. The patient's perception with reference to surgical procedures and SPT is often disregarded. However, patients' motivation and compliance is the key to success and a good long-term prognosis. Most of the recent studies document the importance of adherence to periodontal maintenance programmes (Eickholz et al, 2008; Matuliene et al, 2008). Therefore, compliance as an outcome of the patients' motivation should be focused on and investigated in further studies.

The results of this study show that women feel more sensitive about the outcome of periodontal therapy in relation to social factors. In general, it seems that women care more about their general health, showing greater participation in preventive medical examinations or screenings (Baumann and Blumenstock, 2005; Chernyshov, 2012).

This study demonstrates that the frequency of the supportive periodontal therapy did not influence the patients' perception of the therapeutic outcome. Thus, several studies suggested concepts for treatment planning and an individual schedule of the frequency of SPT (Lang and Tonetti 2003; Bröseler and Tietmann 2007). The treatment schedule for SPT should depend on the patients' individual risk factors.

However, patients who underwent less than 3 years of periodontal maintenance show a more positive perception of treatment success than patients who had SPT for more than 3 years. They

also better appreciated the positive impact on their appearance. No evidence on this topic has been given in the literature so far. Constant motivational guidance is needed during ongoing SPT of any length.

Although treatment costs and time expense in the context of regenerative procedures were perceived as a burden, regenerative procedures were regarded as a necessary therapy aiming for better health conditions and esthetics. In comparison to regenerative therapy, patients did not feel that SRP and OFD led to a full remission of their complaints. As presented in multiple studies and reviews, regenerative procedures result in better clinical outcomes concerning reduction in PPDs and gain in attachment level (Cortellini and Tonetti, 2011).

This is the first study to reveal the benefit on patients' perception using regenerative procedures compared to only SRP or OFD. Thus, these positive effects on oral health are directly linked to better compliance by the patients and play a key role for success and a good long-term prognosis.

Patients who were referred to a specialised periodontal practice noticed a significantly higher improvement in individual well-being, oral health, esthetics and general physical status after treatment than self-referred patients. Referral of patients with severe periodontal disease to a specialised team seems to increase the patient's perception of the severity of their disease, thus making patients more willing to commit to their suggested individual treatment protocol. The interdisciplinary approach of general dental practitioners with specialised dentists and physicians becomes more important, especially with regard to the interaction of periodontal and systemic diseases such as diabetes (Salvi et al, 2008), cardiovascular diseases (Tonetti, 2009) and obesity (Al-Zahrani et al, 2003).

## CONCLUSIONS

The patient's demand to preserve healthy teeth and appearance can be satisfied through systematic periodontal therapy and routinely performed maintenance. Regenerative periodontal procedures increase the patient's perception of remission of symptoms associated with periodontitis compared to resective procedures. Long-term success can be achieved by constant motivational guidance and is needed in SPT of any duration. Concerning patients' motivation, women seem to respond to intrinsic motivational factors, such as the influence of their periodontal conditions on their social environment. An interdisciplinary approach and referral has a higher impact on patient's positive perception. Further trials should investigate clinical results of periodontal therapy regarding patients' expectations.

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