

**“Is Periodontitis and its treatment capable to change  
the quality of life of a patient?”**

By

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**Abstract**

While clinical indicators, or so-called surrogate outcomes in periodontology, allow us to assess periodontal health and evaluate outcomes of periodontal therapy from a clinician’s perspective, they cannot be used to evaluate patients’ subjective perceptions of their health status or satisfaction with the received treatment. These can be assessed through patient-based outcomes, such as quality of life. The aim of this paper is to give an overview of the multidimensional concept of oral health-related quality of life (OHRQoL), its measures and association with **plaque-induced, inflammatory** periodontal diseases. Periodontitis and its clinical consequences, such as tooth loss, have a considerable negative effect on OHRQoL, while periodontal treatment and alleviation of the symptoms can lead to improvement in OHRQoL. Implant rehabilitation of missing teeth also seems to positively influence OHRQoL.

## Key points

- Highlights that patient-based outcomes, such as quality of life, should complement clinical indicators of periodontal status, providing a better understanding of the patient's perceptions of the disease and the treatment.
- Explores the association between plaque-induced, inflammatory periodontal diseases (i.e. gingivitis and periodontitis) and their clinical consequences, and impairment of oral health related quality of life.
- Highlights that periodontal therapy has a well-documented positive impact on OHRQoL, while implant rehabilitation of missing teeth also seems to improve OHRQoL, particularly in edentulous individuals.

## PATIENT-BASED OUTCOMES – WHY DO WE NEED THEM?

Periodontitis is an infectious disease, resulting from an imbalance between the dento-gingival biofilm and host response. Inflammation of the tooth's supportive tissues leads to the destruction of the periodontal ligament and the supportive bone and, as a final result of the disease, it can eventually lead to tooth loss.<sup>(1)</sup>

Periodontal health is an indivisible component of oral and general health. The World Health Organization, in its definition of health, has emphasized the patient's well-being, physical, mental and social states, as opposed to the traditional definitions of health as a mere absence of the disease.<sup>(2)</sup> In periodontology, in order to clinically assess and monitor the status of periodontal health, we employ surrogate markers such as clinical attachment level, probing pocket depth, recession, plaque scores and bleeding on probing. Their relevance in the research and clinical work is indisputable, yet these outcomes are intangible in the patient's mind.<sup>(3)</sup> Our medical acts encompass much more than reducing millimetres of pocket depth. Periodontal treatment, as it will be discussed in this article, reduces symptoms, disability and importantly, improves quality of life. These patient-based outcomes (PBO) can be assessed only by the patients themselves.<sup>(4)</sup>

The importance of the use of PBOs in periodontal therapy lies in the fact that patient's perceived assessments and opinions can differ from clinical indicators.<sup>(5)</sup> Their priority in the research field was identified and emphasized 15 years ago.<sup>(6)</sup> PBOs can thus give both the clinicians and the researchers a comprehensive insight and better understanding of the effects of the disease and the provided therapy, on patients' symptoms, function, psychosocial factors and satisfaction.

## **WHAT IS ORAL HEALTH-RELATED QUALITY OF LIFE AND WHAT TOOLS DO WE USE TO MEASURE IT?**

Oral health, as much as general health, strongly influences quality of life, even though the means of this connection is extremely complex and, in a way, influenced by a mosaic of personal beliefs and subjective values. <sup>(7)</sup> Patients' quality of life, as defined by the World Health Organization, is "perceptions of their position in life in the context of culture and value systems in which they live, and in relation to their goals, expectations, standards, and concerns". It is highly subjective and can change over time as it is influenced by health, social and environmental factors. <sup>(8)</sup>

Oral health-related quality of life is one of the PBOs. It is a multidimensional, intangible and subjective concept and its measurement is complex. OHRQoL can be measured by questionnaires and/or related forms of assessment of the physical, psychological and social well-being, focusing on the possible impact an oral disease and/or treatment have on different dimensions of a person's life. Research in the OHRQoL domain has increased significantly since the mid-nineties <sup>(8)</sup>, henceforth there has been an increase in the number of oral health specific measures and instruments used to evaluate the quality of life. What gives the oral specific measures an advantage over the generic measures is their increased sensitivity, providing more information on the influence of a specific oral condition or disease and the benefits of its treatment on quality of life. Furthermore, oral specific measures have better responsiveness, meaning they are more likely to detect subtle changes in the assessed condition. <sup>(8-10)</sup> The most widely used measures in the domain of OHRQoL research, also often employed in studies on periodontal patients <sup>(5,11-16)</sup>, are the Oral Health Impact Profile (OHIP-14) <sup>(17,18)</sup>, the Oral Impacts on Daily Performances (OIDP) <sup>(19,20)</sup>, the Geriatric/General Oral Health Assessment Index (GOHAI) [REF 18] and the UK Oral Health-related Quality of Life measure (OHQoL-UK®) <sup>(21)</sup>. The content of the presented measures varies, however they all tend to cover how oral conditions affect the physical, psychological and social aspects of life. <sup>(9)</sup> Questionnaires and related instruments employ scales, originating from psychometrics, to assess OHRQoL. Two most commonly used types of scales are the VAS (Visual Analogue Scale) and the Likert scale. <sup>(7)</sup>

## **IS THERE AN ASSOCIATION BETWEEN PERIODONTAL DISEASES AND OHRQoL?**

Studies conducted so far established a clear association between OHRQoL and plaque-induced, inflammatory periodontal diseases, gingivitis and periodontitis.

A large body of evidence corroborates a correlation between periodontitis in particular and OHRQoL. This connection has been explored and established in patients with chronic periodontitis <sup>(11,22-34)</sup> and also in younger individuals and those with aggressive <sup>(35-38)</sup> periodontitis. One of the earliest important studies in this area of research, was by Needleman et al. <sup>(16)</sup>, employing the OHQoL-UK<sup>®</sup> questionnaire, known as OHIP-14. This study reported a considerable effect of periodontal status on quality of life. When assessed through OHIP-14, results showed that there were significant differences for functional limitations, physical pain, psychological discomfort and physical and psychological disabilities between individuals with periodontitis and healthy individuals. <sup>(5,16,39)</sup> Interestingly, the aforementioned study further showed a correlation between the OHRQoL scores and the number of >5mm pockets, suggesting that there is an association between the severity of the disease and overall QoL. This was further confirmed by other studies <sup>(23,26,28,33,39-41)</sup> and one systematic review <sup>(7)</sup> looking into the extent and the severity of the disease and their association with worse OHRQoL.

There also seems to be an association between gingivitis and impaired OHRQoL, albeit weak, although there are some inconsistencies among the reported data. On one hand, studies in children and preadolescents with gingivitis recruited from public schools <sup>(42)</sup>, children attending an examination at a dental hospital and dental practice <sup>(43)</sup>, adolescents and adults up to 30 years of age <sup>(44)</sup> undergoing orthodontic treatment, and household population of Brazilian adolescents <sup>(45)</sup> reported no significant association with impaired OHRQoL. Conversely, there is a number of studies on large, representative samples supporting an association between gingivitis and impaired OHRQoL. A study on Belgian young adults <sup>(36)</sup> and three studies including schoolchildren and adolescents in Sudan <sup>(46)</sup>, Thailand <sup>(47)</sup> and Brazil <sup>(48)</sup>, reported that worse OHRQoL is indeed associated with gingivitis. The possible discrepancy between the reported results could be explained by the differences and variations between the study samples, use of different OHRQoL measures and/or the clinical examination of the gingival status (eg. partial vs full mouth examination).

Finally, presented data suggests there is a proportionate effect: the higher is the periodontal involvement, the higher is the impairment of OHRQoL. Future trials should also capture which is the minimal extent of gingival inflammation that is capable of affecting QoL.

#### **CLINICAL CONSEQUENCES OF PERIODONTITIS – HOW DO THEY AFFECT OHRQoL?**

Research in the domain of OHRQoL of periodontal patients focuses mainly on certain key aspects leading to its impairment: symptoms, functionality and psychosocial impacts.

Symptoms of periodontal disease: swollen, sore and/or receding gums, drifting and missing teeth and oral malodour, have significant impact on all aspects of a patient's quality of life; physical, social and psychological. <sup>(49)</sup> As reported in the literature, these symptoms influence function, comfort, appearance and self-confidence. <sup>(16)</sup>

Oral functionality, in particular chewing, is imperative for maintenance of well-being. Periodontitis, particularly when undiagnosed and/or untreated, is a major determinant of tooth loss in adults. <sup>(50)</sup> Tooth loss leads to functional deterioration in terms of chewing <sup>(51,52)</sup>, which can have far-reaching consequences such as temporomandibular disorders <sup>(29)</sup> and changes in individual's diet and nutritional intake. Thus it is of no surprise that tooth loss is significantly associated with an impaired OHRQoL, as confirmed by a systematic review and meta-analysis by Gerritsen et al. <sup>(53)</sup>, which provided evidence corroborating this association. Furthermore, the results of the same study suggest that the severity of impairment is heavily impacted by the location (loss of anterior teeth) and distribution (fewer occluding units) of missing teeth. When discussing tooth loss and its effects on quality of life, it is as equally important to acknowledge its impact on the self-perceived aesthetics and social well-being. Namely, loss of teeth is associated with limitations in normal daily activities such as smiling in public, formation of relationships and consumption of food, all of which leads to loss of self-appreciation and confidence. <sup>(54)</sup>

Stress, a state of mental or emotional strain resulting from demanding circumstances, can be put in both direct and indirect association with periodontitis. <sup>(55)</sup> Work-related stress in regard to demanding and increased work load, combined with low flexibility at the workplace, inability to make phone calls or leave work for personal reasons, lead to worse OHRQoL and personal self-care. Those with strict working environment and obligations have higher levels of dental plaque as they are more likely not to follow regular oral hygiene practice. <sup>(56)</sup> Such prolonged strain and allostatic load are not only related to poor oral hygiene but other unhealthy behaviours, including smoking, drinking and unregular sleeping patterns, all of which further increase susceptibility to periodontitis. <sup>(57)</sup>

Social life, life experiences and self-confidence are aspects of human nature deeply interwoven with perceptions of happiness and QoL, and also negatively affected by periodontitis. <sup>(16)</sup> Periodontitis can almost be seen as a taboo. Patients would rather not discuss or share about the condition, in terms of tooth loss and shame, causing them to cover their mouth while smiling, and even frustration towards clinicians that have not recognised their disease initially. <sup>(58)</sup> Patients seem to enjoy everyday activities less, with evidence pointing to a lower frequency of smiling and not opening their mouths wide and more subdued reactions when watching funny shows on TV. <sup>(30)</sup>

## **CAN TREATMENT OF PERIODONTITIS IMPROVE OHRQoL?**

Knowing the effect periodontitis has on OHRQoL, it is of interest to further explore the potential effect periodontal treatment and the alleviation of the symptoms of the disease also have on the quality of life. The efficacy and the effectiveness of periodontal therapy in treating and controlling the disease, which can be measured with improvements in its clinical indicators, is well established. <sup>(59)</sup> Studies published thus far almost consistently confirm the effect periodontal therapy has on improvement of quality of life as well. <sup>(11,12,15,60–69)</sup>

A systematic review by Shanbhag et al. <sup>(70)</sup> confirmed the improvement of OHRQoL following non-surgical periodontal therapy. These improvements seem to be stable over a one year time period following non-surgical treatment, as reported in a clinical study by Wong et al. <sup>(61)</sup> The quality of life improvement seems to be not affected by the type of non-surgical treatment employed, in regard to instruments (traditional instrumentation vs. lasers) or treatment approaches (quadrant vs. one stage full-mouth approach). <sup>(15,70)</sup> Surgical periodontal therapy does not appear to significantly add benefits to improvement of quality of life. <sup>(65,68,70,71)</sup> This observation could be explained by the dramatic alleviation of symptoms and already improved quality of life following non-surgical treatment. Therefore, further changes in the condition may not be appreciated or perceived.

## **DOES IMPLANT REHABILITATION OF MISSING TEETH IMPROVE OHRQoL?**

Both periodontitis and dental caries are the leading causes of tooth loss. <sup>(72–74)</sup> Thus a significant number of individuals might experience tooth loss during their lifetime which, as discussed previously, is significantly associated with impairment of OHRQoL. <sup>(53)</sup> On this basis we've further explored the influence tooth rehabilitation, in particular implant therapy, affects OHRQoL. This may give clinicians further insight as to how tooth rehabilitation, being the goal end treatment of stable patients with periodontally-affected dentition, may positively influence their quality of life.

There is a variety of treatment modalities for those affected by tooth loss, both partially dentate and edentulous. Knowledge of the extent to which tooth loss and certain prosthetic treatment modalities affect OHRQoL is relevant for clinical decision making and provision of appropriate treatment options for the patient. Several systematic reviews of the literature evaluating the impact of implant-supported

prostheses on OHRQoL in partially dentate <sup>(75-78)</sup> and/or edentulous patients <sup>(37,75-81)</sup> have been published thus far.

### **Edentulous patients**

The majority of the studies evaluating impact of implant placement on OHRQoL focus on the edentulous population and mandibular overdentures in particular, as patients wearing conventional complete mandibular prostheses may very often experience poor retention and consequently chewing, aesthetic and social problems. <sup>(82,83)</sup>

Even though a large body of evidence suggests that implant-supported overdentures (IODs) are indeed associated with an increase in OHRQoL, data has to be interpreted with caution as there is considerable methodological variation and inconsistencies across studies. Systematic reviews by Kutkut et al. <sup>(37)</sup> and Thomason et al. <sup>(75)</sup> report superiority of IODs over conventional dentures (CDs) in terms of masticatory performance <sup>(37)</sup> and improvements in OHRQoL <sup>(37,75)</sup>. The systematic review by Strassburger et al. <sup>(77,78)</sup> also suggests an increase in OHRQoL in IOD wearers following treatment, yet reports that no further improvements in terms of OHRQoL or patient satisfaction can be achieved with placement of more than two implants.

Boven et al. <sup>(80)</sup> reviewed literature assessing masticatory performance, bite force, nutritional state, patient satisfaction and QoL in edentulous patients receiving mandibular IOD and/or maxillary IOD instead of a CD. And while patients' satisfaction improved after treatment with IOD, this did not necessarily lead to improvement in general QoL or OHRQoL. Emami et al. <sup>(79)</sup> identified only RCTs comparing CD and IODs in edentulous patients in terms of patient satisfaction, oral and general QoL, 8 out of which were included in the meta-analysis. Analysis of the data demonstrated that treatment with mandibular IODs instead of new CD may yield better scores in term of patients' satisfaction and OHRQoL, yet due to significant heterogeneity between the studies the true effect is left uncertain. Systematic review and meta-analysis by Sivaramakrishnan and Sridhara analyzed 5 studies assessing OHIP improvements between OI and CD treatment patient groups. <sup>(81)</sup> The OI group exhibited statistically significant improvement of total scores, and in all subgroups except the domain of physical pain. The review was, however, greatly limited due to high risk of bias in selection and ascertainment of outcome measures.

A systematic review by Reissmann et al. <sup>(76)</sup>, analysing data from 32 studies conducted in edentulous patients, reported that OHRQoL improves both with IOD and CD, yet the improvement is slightly increased for IODs. The authors do argue that this finding is not observed in all reviewed studies. One of the possible

explanations for increased OHRQoL in patients with IODs could be that implants are usually requested by- and could be more beneficial to patients with advanced alveolar bone resorption and severe denture problems, which was also hypothesized by other authors. <sup>(78,84,85)</sup> Thus, the authors further suggest that in patients that are willingly seeking implant treatment, with initially highly impaired OHRQoL, superior quality of life improvements will be reported than in those receiving a CD treatment. Indeed, the level of satisfaction of patients that are already content with their existing CD does not improve significantly after implant placement. <sup>(86)</sup> A study including all patients who believed they would receive new CDs, showed no significant differences post-treatment between those receiving OIDs or CDs <sup>(87)</sup>, even though it has to be taken into consideration that the treatment effect may be masked by application of "intention to treat" analysis.

One of the major challenges and drawbacks in understanding the real impact of OID treatment on OHRQoL is that, despite the large number of published studies, there is a substantial variety in reported outcome assessment measures. This complicates and/or prevents comparison of results of different studies leading to insufficiency of robust evidence. As a limitation of the studies published thus far, it is also worth noting that short term follow-ups do not enable observation of potential deterioration in OHRQoL as a result of implant failures or incidence of peri-implant diseases.

### **Partially dentate patients**

In terms of association between OHRQoL and implant-supported fixed prostheses in partially dentate patients, there is not a sufficient body of evidence that would imply that implant-supported fixed prostheses (FDP) are superior in OHRQoL improvement when compared to conventional, teeth-supported FDP. <sup>(76)</sup> There is some evidence that patients with implant-supported FDP report better OHRQoL than those with removeable partial denture (RPD). <sup>(76)</sup> Studies also report significant implant-related improvements in OHRQoL was positively associated with the number of missing teeth in the anterior region (88,89), which also supports the aforementioned effect that loss of anterior teeth has on OHRQoL and perceived aesthetics. Other treatment approaches for partially dentate patients are not well represented in the literature to be able to quantify the effect of treatment choice.

### **HOW TO INTERPRET CHANGES IN OHRQoL MEASURES?**

Studies mostly focus on statistical differences of OHRQoL measure scores without highlighting whether these differences are actually clinically meaningful for the patient or the clinician. Thus, interpreting



changes in PBO scores should be based on the calculation of minimal important difference (MID). (90) From a patient's perspective, MID is the smallest difference in a PBO measure score that they can perceive as favourable or harmful. For a clinician, MID may imply a consideration of the change of treatment. MID for OHRQoL measures has been calculated and reported in certain studies on patients with periodontitis<sup>(67)</sup> and dentine hypersensitivity<sup>(91)</sup> of patients undergoing SPT.

## CONCLUSION

Periodontal diseases, and tooth loss associated with untreated periodontitis, have a well-documented influence on patients' quality of life. In the past two decades there has been a significant increase in research in the domain of OHRQoL, yet some clinicians are still not familiar with the concept, its value and implications it might have on their clinical work. Thus, this paper highlights and emphasises that traditionally recorded clinical measurements taken by the periodontal probe should be supplemented with patient-based outcomes, such as OHRQoL. It also aims to give a comprehensive view on why there is a real merit in awareness of patients' subjective perceptions and assessments of their disease, and the treatment they're undergoing, both periodontal therapy and tooth rehabilitation. Taking all of this into account could give a better insight and understanding of the effects of the disease and provided therapy on symptoms, function, psychosocial factors and patients' satisfaction with the treatment. This knowledge could therefore facilitate the provision of patient-centred care. We should aim not only to treat their disease, but also to make their lives better.

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