

The role of non-surgical periodontal treatment in enhancing quality of life for hypertensive patients with periodontitis

O papel da terapia periodontal não cirúrgica na melhoria da qualidade de vida de pacientes hipertensos com periodontite

João Victor Soares RODRIGUES^{a,b}, Mariella Boaretti DEROIDE^a, Amanda Paino SANT'ANA^c, Rafael Scaf DE MOLON^a, Leticia Helena THEODORO^{a,b}

^aUNESP – Universidade Estadual Paulista “Júlio de Mesquita Filho”, Faculdade de Odontologia de Araçatuba, Departamento de Diagnóstico e Cirurgia, Araçatuba, SP, Brasil

^bUNESP – Universidade Estadual Paulista “Júlio de Mesquita Filho”, Faculdade de Odontologia de Araçatuba, CAOE - Centro de Assistência Odontológica à Pessoa com Deficiência, Araçatuba, SP, Brasil

^cUNESP – Universidade Estadual Paulista “Júlio de Mesquita Filho”, Faculdade de Odontologia de Araçatuba, Departamento de Materiais Odontológicos e Prótese, Araçatuba, SP, Brasil

How to cite: Rodrigues JVS, Deroide MB, Sant'Ana AP, De Molon RS, Theodoro LH. The role of non-surgical periodontal treatment in enhancing quality of life for hypertensive patients with periodontitis. Rev Odontol UNESP. 2024;53:e20240030. <https://doi.org/10.1590/1807-2577.03024>

Resumo

Introdução: A periodontite é um indicador de risco para pacientes hipertensos, e há indicações de que a inflamação sistêmica está associada a ambas as condições. **Objetivo:** Investigar o impacto da terapia periodontal não cirúrgica (TPNC) na qualidade de vida relacionada à saúde bucal em pacientes com hipertensão arterial refratária e periodontite. **Material e método:** 27 participantes com hipertensão arterial refratária e periodontite estágio III e IV, grau B receberam a TPNC. Os parâmetros clínicos periodontais avaliados foram profundidade de sondagem (PS), nível de inserção clínica (NIC), sangramento à sondagem (SS) e índice de placa (IP). A qualidade de vida foi mensurada através do questionário *Oral Health Impact Profile* (OHIP-14). No período de acompanhamento foram avaliados vinte e quatro participantes aos 90 dias e vinte e dois aos 180 dias. Os dados foram submetidos a análise estatística ($\alpha=5\%$). **Resultado:** Os parâmetros clínicos periodontais PS, SS e IP apresentaram diferenças estatisticamente significativas entre os períodos avaliados. A pontuação da soma dos escores do OHIP-14 foi significativamente menor aos 180 dias após o tratamento. Os resultados demonstraram que houve melhora da qualidade de vida nos subdomínios de “dor física”, “deficiência psicológica” e “deficiência social” aos 180 dias pós-tratamento. **Conclusão:** esses achados mostram o impacto positivo da TPNC na qualidade de vida de pacientes com hipertensão arterial refratária e periodontite.

Descritores: Qualidade de vida; periodontite; hipertensão; raspagem dentária.

Abstract

Introduction: Periodontitis is a known risk factor for hypertensive subjects, with evidence suggesting that general inflammation is linked to both disorders. **Objective:** To investigate the influence of non-surgical periodontal therapy (NSPT) on the oral health-related quality of life in subjects with refractory arterial hypertension and periodontitis. **Material and method:** 27 patients with refractory hypertension and stage III and/or IV, grade B periodontitis experienced NSPT. Clinical periodontal parameters, including probing depth (PD), clinical attachment level (CAL), bleeding on probing (BoP), and plaque index (PI), were assessed. Quality of life was assessed by the Oral Health Impact Profile questionnaire (OHIP-14). During the follow-up, 24 participants were evaluated at 90 days, and 22 participants at 180 days. Data were analyzed statistically ($\alpha=5\%$). **Result:** Substantial enhancements were detected in periodontal parameters PD, BoP, and PI across the evaluated periods. Additionally, the sum of OHIP-14 score was significantly reduced at 180 days post-treatment. Notably, responses related to the subdomains “physical pain,” “psychological



disability," and "social disability" indicated an improvement in quality of life after 180 days of treatment. **Conclusion:** These findings highlight the positive impact of NSPT on the quality of life of patients with refractory arterial hypertension and periodontitis.

Descriptors: Quality of life; periodontitis; hypertension; dental scaling.

INTRODUCTION

Hypertension is the primary condition responsible for cardiovascular alterations¹. It is a complex chronic disease characterized by higher systolic and diastolic blood pressure, exceeding 140 mmHg and 90 mmHg, respectively². Globally, approximately 1.38 billion individuals (31.1% of the adult population) are affected by hypertension, with its prevalence strongly linked to aging and quality of life²⁻⁴. Several behavioral, nutritional, and psychological factors contribute to the progress and advancement of hypertension, comprising stress, obesity, high sodium and alcohol intake, smoking, physical inactivity, and improper use of antihypertensive medications^{4,5}. Although hypertension can be managed with medication, inadequate control increases the risk of complications such as coronary artery disease, stroke, vision impairment, kidney disease, and immunoinflammatory conditions like rheumatoid arthritis, psoriasis, systemic lupus erythematosus, and periodontitis^{2,4,5}.

Periodontitis is an inflammatory chronic condition driven by an imbalance in the dental biofilm and the host's immune response⁶. This disease is marked by the gradual destruction of the periodontium that might lead to teeth loss, resulting in functional and aesthetic impairments. These changes not only diminish quality of life but also negatively affect overall systemic health⁶⁻⁹. Clinically, periodontitis presents with loss of clinical attachment, alveolar bone resorption, gingival bleeding, and the development of periodontal pockets¹⁰. An estimated 11.2% of the global population is affected by periodontitis⁷, making it the 6th highest predominant condition worldwide. As such, it represents a significant public health concern, with notable socioeconomic implications^{1,7,8}. Several risk and modifying factors are associated with periodontitis, including poor dental restorations, diabetes mellitus, smoking, cardiovascular diseases, obesity, rheumatoid arthritis, and respiratory infections^{8,9,11}.

The connection between hypertension and periodontitis is largely driven by elevated inflammation, which results from the simultaneous release of pro-inflammatory cytokines and the occurrence of pathogens like *Porphyromonas gingivalis*. These pathogens can enter the bloodstream across ulcerated epithelium and, along with migrating monocytes, contribute to the development of atherosclerotic plaques^{2,4}. This process leads to endothelial dysfunction, which acts as a pro-atherogenic stimulus^{2,4}. Consequently, effective periodontal treatment reduces the inflammatory process in the periodontal tissues, preventing the release of inflammatory mediators and endothelial dysfunction. This contributes to improvements in both oral health and blood pressure, ultimately enhancing quality of life^{1,4,12}.

As noted by Taques et al.¹³, quality of life is a complex concept tied to oral health and can be evaluated through various questionnaires, such as the Oral Health Impact Profile (OHIP-14), Oral Impacts on Daily Performances (OIDP), Dental Impact on Daily Living (DIDL), Dental Impact Profile (DIP), and the Scale of Oral Health Outcomes (SOHO)^{13,14}. Quality of life is multidimensional, encompassing social, psychological, physical, and environmental aspects¹²⁻¹⁴. Changes in the oral cavity can significantly impact quality of life by affecting diet, appearance, speech, social interaction, self-esteem, and sleep¹³. Periodontal disease directly influences these factors through its clinical manifestations, such as swelling, bleeding, tooth sensitivity, mobility, halitosis, and eventual tooth loss¹²⁻¹⁵. Research has shown that treating periodontal disease not only benefits systemic health but also improves quality of life^{12,15,16}. Therefore, this study aimed to assess the influence of non-surgical periodontal therapy (NSPT) on the oral health-related quality of life (OHRQoL) in subjects with refractory arterial hypertension and periodontitis.

MATERIAL AND METHOD

Study Design and Sample Selection

The current study is a retrospective investigation stemming from a clinical trial conducted in Brazil². The study protocols received approval from the Human Research Ethics Committee at the Dentistry School of Araçatuba (CAAE: 14338819.5.0000.5420) and were registered with the Brazilian Registry of Clinical Trials (RBR-9d78qy).

The study involved twenty-seven patients diagnosed with refractory arterial hypertension (RAH) and periodontitis. All participants offered written informed consent, which was accepted by the Ethics and Human Research Committee. To qualify for inclusion, patients needed to meet the following criteria: a diagnosis of stage III and/or IV, grade B periodontitis¹⁰, and a confirmed diagnosis of RAH with blood pressure readings of ≥ 140 mmHg systolic and ≥ 90 mmHg diastolic for a minimum of five years¹⁷.

Exclusion criteria included current or former smokers; individuals with anemia, active cancer, or blood disorders; pregnant women; those with chronic kidney disease; individuals with type II diabetes mellitus (HbA1c > 7.0); those with a history of bacterial endocarditis; patients who had received any form of periodontal therapy in the past six months; those currently taking antibiotics or anti-inflammatory medications; individuals with systemic conditions affecting periodontal disease; patients experiencing chemotherapy or radiotherapy for head and neck cancers; and individuals with medical conditions necessitating antibiotic or that could impact treatment response, as well as those with alcoholism or illicit drug use².

Clinical Examination

Clinical periodontal assessments were accompanied using a manual periodontal probe (PCPUNC-15, Hu-Friedy, Chicago, IL, USA) to evaluate probing depth (PD), clinical attachment level (CAL), bleeding on probing (BoP), plaque index (PI), and the number of teeth present. All measurements were performed by a calibrated examiner (JVSJ) and were done as previously described².

Interventions and Treatment Protocol

The initial treatment for periodontitis involved the NSPT through subgingival instrumentation (SI) combined with oral hygiene instruction (OHI)¹⁸. Participants received a 1.5-hour session of SI, employing Gracey and McCall manual curettes (Hu-Friedy, Chicago, IL, USA). Follow-up clinical examinations occurred at 90 and 180 days post-treatment².

Oral Health-Related Quality of Life

The Oral Health Impact Profile (OHIP-14)¹⁹, derived from the OHIP-49, is a questionnaire designed to assess the influence of oral health conditions on the quality of life in the general population. It consists of 14 items spread across seven dimensions: functional limitation (2 items), physical pain (2 items), psychological discomfort (2 items), physical disability (2 items), psychological disability (2 items), social disability (2 items), and disability (2 items). Responses are rated on a 5-point Likert scale, ranging from 0 to 4 (never, rarely, sometimes, often, and always). Scores are calculated according to the manual, with higher scores indicating poorer quality of life. The questionnaire has been translated, culturally adapted, and validated for use in Brazil²⁰. At baseline, the questionnaire was administered after the participant consented to join the study and prior to any dental treatments. It was again administered at 90 and 180 days after all clinical data were collected.

Statistical Analysis

Data from the clinical examinations (mean ± standard deviation) and OHIP-14 scores were entered directly into an electronic spreadsheet (Excel; Microsoft Corp) by a single evaluator. Patient data were analyzed at baseline, 90 days, and 180 days. The Shapiro-Wilk test was used to assess the normality of the data distribution. Clinical data were analyzed using the Kruskal-Wallis test with Dunn's post hoc test. Changes in OHIP-14 scores over baseline, 90 days, and 180 days were also evaluated using the Kruskal-Wallis test with Dunn's post hoc test, while comparisons between subdomain responses were made using the Chi-square test. All analyses were conducted using GraphPad Prism version 8.0c (GraphPad Software, CA, USA) at a significance level of 5%.

RESULT

Clinical Parameters

The periodontal clinical parameters (PD, BoP and PI) exhibited substantial disparities between the time evaluated, according to the Table 1. Specifically, there was a reduction in PD at both 90 days and 180 days compared to baseline ($p=0.0006$ and $p=0.0014$, respectively). Additionally, the percentage of BoP decreased at 90 days and 180 days in comparison to baseline ($p=0.0027$ and $p<0.0001$, respectively). Similarly, the percentage of PI also showed a decline at 90 days and 180 days when compared to baseline ($p=0.0014$ and $p=0.0035$, respectively).

Table 1. Clinical periodontal data (Mean±SD) from the baseline, 90 and 180 days

Variables	Baseline (n=27)	90 days (n=24)	180 days (n=22)	p value
Number of teeth	22.4±4.3	23.1±3.9	22.8±4	0.8797
PD (mm)	2.7±0.3	2.46±0.16*	2.48±0.15*	0.0001
CAL (mm)	3.4±0.6	3.13±0.5	3.18±0.6	0.0984
BoP (%)	39.7±19.4	20±8.7*	16.8±7.8*	<0.0001
PI (%)	38.2±27.6	16.3±9.2*	19.8±16.4*	0.0004

Abbreviations: PD= probing depth; CAL= clinical attachment level; BoP= bleeding on probing; PI= plaque index. The parameters were evaluated using the Kruskal-Wallis test followed by Dunn's post hoc test. *Statistically significant difference with baseline ($p < 0.05$).

OHIP-14

Figure 1 shows the results obtained from the OHIP-14 questionnaire to determine quality of life. The total OHIP-14 scores were significantly lower after 180 days of periodontal therapy ($p=0.0026$).

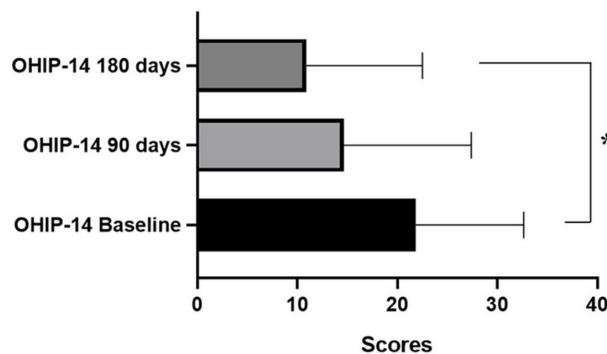


Figure 1. The total OHIP-14 scores across all subdomains were recorded at baseline, 90 days, and 180 days post-treatment. *Statistically significant difference between periods ($p < 0.05$; Dunn's post hoc test).

Figure 2 presents the values obtained in each of the seven domains evaluated by OHIP-14. The values represent the sum of response frequencies related to the subdomains. Statistically significant differences were observed in three of the seven domains across the time periods. In the 'physical pain' domain, there was a notable reduction in the perception of pain, while 'psychological disability' and 'social disability' also decreased after 180 days of treatment ($p = 0.0005$, $p = 0.0118$, and $p = 0.0418$, respectively). In the other domains physical inability, psychological discomfort, handicap, functional limitation, no statistically significant differences were identified between the periods ($p > 0.05$).

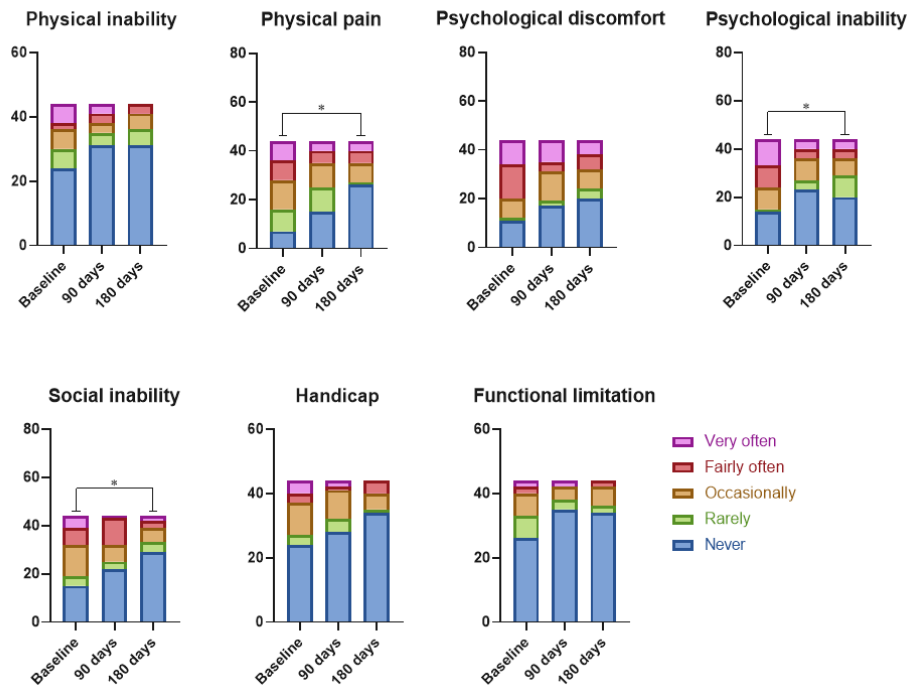


Figure 2. Frequency of responses across the OHIP-14 subdomains at baseline, 90 days, and 180 days. *Statistically significant differences were observed at 180 days compared to baseline ($p < 0.05$; Chi-square test).

DISCUSSION

Hypertension and periodontitis are chronic inflammatory disorders with an elevated occurrence among adults^{2-4,6,7}. Despite their numerous clinical consequences, studies that comprehensively explore the interrelationship between these diseases and their impact on quality of life remain scarce. This retrospective clinical study revealed that hypertensive patients with stage III or IV, grade B periodontitis¹⁰ treated with NSPT combined with OHI, and followed by 90 and 180 days, experienced important improvements in periodontal clinical parameters, which corroborates previous clinical study². Additionally, these interventions demonstrated an encouraging influence on the patients' quality of life.

Previous work involving 500 patients found a considerable relationship between periodontitis and blood pressure²¹. Hypertensive patients with periodontitis had a prevalence of 43% for diastolic blood pressure (DBP) and 14% for systolic blood pressure (SBP), compared to control group²¹. Similarly, a cross-sectional study including 270 patients revealed a connection between tooth loss and elevated blood pressure, with an average DBP of 135.60 mm Hg among patients with tooth loss, where periodontitis was a leading cause^{10,22,23}. Other study have also reported improved blood pressure following periodontal treatment²⁴. However, our study did not show a substantial difference in SBP and DBP at baseline or after 90 and 180 days of follow-up². This outcome is coherent with a cross-sectional study of 77 patients, which also did not demonstrate a significant association between chronic periodontitis and hypertension^{4,25}.

Recent review manuscript has demonstrated a strong link between periodontitis and an increased risk of hypertension¹. Periodontitis, a chronic inflammatory disease driven by a dysbiotic biofilm, initiates a complex immune response. The accumulation of periodontal pathogenic microorganisms in the periodontal pockets triggers a persistent inflammatory state, which leads to the release of pro-inflammatory mediators such as cytokines, interleukins (e.g., IL-1, IL-6), and tumor necrosis factor-alpha (TNF- α). These mediators not only contribute to the destruction of the periodontal tissues, including alveolar bone and connective tissue, but also have systemic effects that extend beyond the oral cavity². One of the key systemic consequences of periodontitis is its impact on endothelial function. The inflammatory cytokines and bacterial byproducts, such as lipopolysaccharides (LPS), enter the bloodstream, promoting endothelial dysfunction by impairing nitric oxide production a critical regulator of vascular tone. This disruption of endothelial homeostasis can lead to increased vascular resistance and elevated blood pressure, which is a major contributing factor to hypertension². Moreover, chronic inflammation associated with periodontitis has been shown to induce oxidative stress, further damaging vascular structures and exacerbating cardiovascular risks⁴. In addition to hypertension, periodontitis has been linked to other systemic comorbidities, such as diabetes mellitus, atherosclerosis, and adverse pregnancy outcomes¹.

Concerning periodontal clinical parameters, a recent cross-sectional study of 97 patients who had been using antihypertensive medications for at least five years found important differences in CAL, PD, and PI values between hypertensive patients with and without periodontitis²⁶. In our study, NSPT, combined with OHI, provided benefits in PD, BoP, and PI after 90 and 180 days.

Considering the impact of NSPT on quality of life, patients completed a 14-list questionnaire (OHIP-14) that evaluated the influence of oral conditions, demonstrating significant improvements regarding physical pain, psychological inability and social inability after 180 days of periodontal treatment. A recent cross-sectional study involving 150 individuals evaluated the consequences of periodontitis and its treatment on OHRQoL. The study concluded that periodontitis significantly impairs quality of life, but NSPT can lead to notable improvements²⁷. Further supporting these findings, a systematic review and umbrella review explored the relationship between periodontal disease and quality of life, confirming that periodontitis has a negative impact on OHRQoL. However, NSPT has been shown to increase these quality of life measures¹⁶. A review of 13 studies reinforced these conclusions, highlighting significant improvements in areas such as physical disability, psychological distress, and functional limitations after periodontal treatment, especially in studies with long-term follow-up²⁸.

Despite these positive findings, some inconsistencies remain. James et al.¹⁴ in their meta-analysis, noted that studies evaluating the connection between periodontitis and OHRQoL did not always show substantial differences. These studies commonly used questionnaires like the Oral Impacts on Daily Performances and OHIP-14, but variability in the outcomes suggests that further research may be needed to fully understand the scope of periodontal treatment's impact on quality of life.

CONCLUSION

In conclusion, our data demonstrated that NSPT improved OHRQoL of patients with combined periodontitis and refractory arterial hypertension. Further randomized clinical trials should be conducted with increased number of patients and extended follow-up period before definitive conclusions can be drawn.

AUTHORS' CONTRIBUTIONS

Conceptualization, L.H.T. and J.V.S.R.; methodology, J.V.S.R., M.B.D., A.P.-S and L.H.T.; software, A.P.-S. and R.S.M.; validation, L.H.T., J.V.S.R., and R.S.M.; formal analysis, J.V.S.R. and A.P.-S.; investigation, J.V.S.R., A.P.-S and M.B.D.; resources, J.V.S.R., L.H.T.; data curation, M.B.D. and A.P.-

S.; writing - original draft preparation, M.B.D. and L.H.T.; writing - review and editing, J.V.S.R., M.B.D., R.S.M and L.H.T.; visualization, R.S.M. and L.H.T.; supervision, R.S.M and L.H.T.; project administration, L.H.T.; funding acquisition, L.H.T. All authors have read and agreed to the published version of the manuscript.

ACKNOWLEDGMENTS

The authors would like to thank the Periodontics Department at the Araçatuba School of Dentistry and the Center for Dental Assistance to Persons with Disabilities (CAOE) at the São Paulo State University UNESP.

FUNDING

This work has been carried out through funding by *Coordenação de Aperfeiçoamento de Pessoal de Nível Superior—Brazil (CAPES; Funding code 001)*. RSM is currently supported by grant provided by São Paulo Research Foundation (Fundação de Amparo à Pesquisa do Estado de São Paulo) – FAPESP (Process #2023/15750-7).

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CONFLITC OF INTEREST

The authors declare no conflicts of interest.

***CORRESPONDING AUTHOR**

Leticia Helena Theodoro, UNESP – Universidade Estadual Paulista “Júlio de Mesquita Filho”, Faculdade de Odontologia de Araçatuba, Departamento de Diagnóstico e Cirurgia, Rua José Bonifácio, 1193, Vila Mendonça 16015-050 Araçatuba, SP, Brasil, e-mail: leticia.theodoro@unesp.br

Received: October 17, 2024

Accepted: October 22, 2024