https://doi.org/10.5272/jimab.2023294.5174

Journal of IMAB
ISSN: 1312-773X
https://www.journal-imab-bg.org

Journal of IMAB. 2023 Oct-Dec;29(4)

Review article

THE RELATIONSHIP BETWEEN PERIODONTAL HEALTH AND FIXED PROSTETHIC RESTORATIONS

Tsvetalina Gerova-Vatsova, Stefan Peev, Ralitsa Yotsova
Department of Periodontology and Dental Implantology, Faculty of Dental Medicine, Medical University of Varna, Bulgaria.

ABSTRACT

Periodontal health and various types of dental restorations are very closely related.

On the one hand, periodontitis is a multifactorial disease. The main etiological factor is the microflora found in dental plaque. Plaque retentive factors - both natural and iatrogenic - are extremely important for the development of an inflammatory process of the periodontium. Among the most common iatrogenic plaque retentive factors are overhanging interproximal restorations (direct and indirect) and not precisely made prosthetic fixed structures.

On the other hand, for restorative dentistry to be successful, it is necessary to first achieve periodontal health in the respective area, which should be maintained after the fabrication and placement of the dental restoration

Keywords: periodontitis, dental restorations, plaque retentive factors, periodontal health, periodontology,

BACKGROUND

The aim of our study is to make a systematic analysis of the scientific activity related to the relationship between periodontal health and restorative dentistry. A systematic review of a number of articles related to the relationship between periodontal health and restorative dentistry published in PubMed and Google Scholar through 2022 was performed.

RESULTS AND DISCUSSION

Periodontitis is a multifactorial disease. The main etiological factor is the microflora found in dental plaque [1]. Plaque retentive factors - both natural and iatrogenic - are extremely important for the development of an inflammatory process of the periodontium. Inadequate dental restorative procedures that contribute to gingival inflammation and periodontal destruction are called iatrogenic placretentive factors. Among the most common iatrogenic placretentive factors are overhanging interproximal restorations and poorly adapted prosthetic fixed structures [2, 3, 4].

Periodontal health and various types of dental restorations are very closely related. Periodontal tissues play a key role in the aesthetics and function of the teeth. In order for restorative dentistry to be successful, it is necessary to first achieve periodontal health in the respective area, which should be maintained after the fabrication and placement of the dental restoration [5]. Way back in 1912, Black A. [6] first addressed the topic of the close relationship between periodontal health and dental restorations.

The long-term success of cosmetic and restorative dentistry depends on well-designed restorations and the patient's periodontal health [7, 8]. The precision of the constructs can be affected by the restorative material, the manufacturing technology, the design of the tooth preparation, the cementation technique and the aging of the construct. Marginal adaptation is key to the clinical success of the prosthetic construct [9].

In 2001 Goldberg PV, et al. [10] paid serious attention to basic biological and mechanical principles from a periodontal perspective during restorative and implant therapy. Sufficient width of the attached gingiva should be present in the esthetic zone, which will reduce the possibility of recession after tooth filing, facilitate restorative procedures and ensure patient comfort. Another thing of utmost importance is that the edges of the structures should not be positioned more than 0.5mm into the gingival sulcus, otherwise, the biological width area of the corresponding tooth would be affected. The team notes that pulling back the soft tissue to precisely imprint the area must be done mechanically, rather than using lasers or electrosurgery, because of the chance of damaging the cementum, bone and soft tissue around the teeth. Regarding implant therapy, the important role of the prosthetically correct position of the implants is emphasized.

In 2014, Reeves J. [7] concluded that the prevention of periodontal and/or peri-implant disease is fundamental to the long-term performance of cosmetic and restorative restorations. It is important that restorations are designed to minimize plaque build-up and maximize access for better personal oral hygiene. Loose direct and indirect restorations, non-removable constructs with poor marginal fit and implant prosthetics with inadequate hygienic access significantly increase the risk of periodontal and peri-implant disease.

In 2017 Culshaw S. [11] concluded that in order to accurately fabricate a given dental restoration, it is necessary to have periodontal health in the area. Good periodontal health ensures easier tissue handling during tooth preparation, more accurate impression taking and a perfect fit of the restoration. Thus, the possibility of the formation of a placretentive factor that compromises the treatment is reduced.

In 2017 Shah DS, et al. [12] evaluated the adaptation of the gingival biotype after a prosthetic fixed restoration. The team found that the gingival biotype can undergo a transformation as a result of the prosthetic restoration from a thick to a thin gingival biotype. In addition, they noted that areas with a thin gingival biotype are at a higher risk of gingival recession formation.

In 2018 in the prospective clinical study, it was found that two years after the restoration of teeth with single zirconia crowns, which were filed without a threshold, the gingival condition in aesthetic and functional terms was very good. No inflammatory processes were observed [13].

In the same year, Ercoli C, et al. [14] found that placing the limits of a given restoration in the area of the connective epithelium or in the area of the connective tissue attachment can be associated with an inflammatory process of the gingiva and possibly the appearance of recession in the area. Threshold filing, the threshold of which is located in the area of the gingival sulcus, does not cause gingivitis if patients have satisfactory personal oral hygiene.

In 2018 Hao Y, et al. [15] examine the influence of the materials from which the prosthetic structures are made on the oral biofilm. The authors conclude that microbial adhesion and biofilm formation can be strongly influenced by material surface characteristics – chemical composition, surface roughness, surface free energy, surface topography, ion release, etc.

In 2020 Reddy RV, et al. [2] carried out an epidemiological study, the objectives of which were to determine the extent of the prevalence of abutting interproximal restorations and their effect on periodontal status in the respective area. The team concluded that the gapped interproximal restorations and especially the subgingival ones cause gingivitis and have a negative effect on the periodontal status of the corresponding tooth.

In the same year, León-Martínez R, et al. [16] performed a systematic review and meta-analysis, the aim of which was to analyze the periodontal condition around threshold filed teeth restored with metal-ceramic and zirconia crowns. The authors found that more periodontal disorders were observed in threshold filed teeth than in untreated control teeth.

In 2020 an evaluation of the quality of impressions for the fabrication of fixed prosthetic structures is published. It turns out that there is a high frequency of errors found in the impressions for making non-removable fixed structures from various private laboratories. This result, the authors define as worrisome because it will lead to inaccurately made constructions, which will be defined as placretentive, compromising the periodontal health of the patients [17].

In 2021 Ercoli D, et al. [18] investigated the relationship between Fixed Dental Prostheses and Restorations and the periodontium. The results of the study showed that areas with subgingival restorations experienced gingival inflammation, probing bleeding, increased probing depth, and loss of clinical attachment level. However, it turns out that to cause more serious periodontal disease, i.e. to be present and bone resorption, it is necessary that the overhanging edges of the restorations (direct or indirect) and the fixed structures are significant. The authors also reported that different materials of crown restorations were associated with different clinical responses. The conclusion of the study is that the precise performance of modern procedures and materials used for restorations and fixed structures are compatible with periodontal health as long as the patient is trained and motivated in adequate personal oral hygiene.

In 2021 Heboyan M, et al. [19] performed a bacteriological evaluation of the gingival crevicular fluid

around teeth that had been restored with non-removable fixed constructs. A total of 129 subjects were studied, who were divided into three groups – the first group of patients with a metal-ceramic structure based on cobalt-chromium, produced by a conventional method; the second group of patients with cobalt-chromium-based metal-ceramic constructs produced by the computer-aided design and computer-aided manufacturing (CAD/CAM) technique and the third group of patients with zirconia-based ceramic constructs produced by CAD/CAM CAM technology. Gingival crevicular fluid is examined before treatment, at 6 and 12 months after prosthetic treatment. Bacteriological and bacterioscopic analysis of GCF was performed. The authors concluded that in all three groups of patients at 12 months, the number of microorganisms in the GCF decreased dramatically compared to that before the prosthesis. It is also found that with zirconium-based ceramic structures, the inflammatory processes in the periodontium occur much more slowly due to the biocompatibility of zirconium oxide.

In 2021 Avetisyan A, et al. [20] published a study that aimed to investigate the effects of different types of non-removable fixed constructs on periodontal tissues. The authors concluded that fixed structures fabricated using the CAD/CAM technique had a better periodontal outcome compared to conventionally fabricated fixed structures. In addition, the better result of zirconium-based ceramic structures made by CAD/CAM technique in terms of periodontal health, lower inflammatory process and facilitated personal oral hygiene was found.

In 2022 Srimaneepong V, et al. [21] set out to review and present the current knowledge regarding the various biomaterials used in prosthetic dentistry and to highlight the interrelationship between periodontal health and prosthetic restorations. Poorly adapted structures in the area of the margo-gingivalis lead to an increased accumulation of dental biofilm, which in turn can lead to the development of dental caries and/or gingivitis, which subsequently progresses to periodontitis.

CONCLUSION

The research presented demonstrates the close relationship between periodontal health and restorative dentistry. The systematic review of the cited articles forms two main statements. The first claim is that with the exact fabrication and fixation of the designed restorations by the dentist and the maintenance of satisfactory oral hygiene by the patient - no gingival inflammation and destruction of the periodontium is observed. The second claim is that pre-existing periodontal health plays a key role in the long-term successful outcomes of restorative dentistry.

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Please cite this article as: Gerova-Vatsova T, Peev S, Yotsova R. The relationship between periodontal health and fixed prosthetic restorations. *J of IMAB*. 2023 Oct-Dec;29(4):5174-5177.
[Crossref - https://doi.org/10.5272/jimab.2023294.5178]

Received: 13/02/2023; Published online: 20/10/2023

Address for correspondence:
Tsvetalina Gerova-Vatsova
Department of Periodontology and Dental Implantology, Faculty of Dental Medicine, Medical University of Varna
84, Tsar Osvoboditel Str., Varna, Bulgaria.
E-mail: cvetalina21@gmail.com,