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Impact of Magnets Inserted into Overdentures on the Periodontal Indices

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Abstract

Background: Preserving teeth with compromised periodontal support when using tooth-supported removable dentures (overdentures—ODs) presents challenges related to periodontal tissue condition and denture retention.
The aim of the study was to assess the effects of inserting magnets into the OD base on periodontal tissue indices around abutment teeth (AT) beneath ODs.
Methods and Results: The 136 vital canines/premolars were included in the study. Experimental group (EG) involved 48 partially edentulous patients with 96 AT's in lower jaw while upper had complete denture, assuming subgroups: A) split mouth samples of 24 patients/24 teeth with magnets inserted in denture base around AT on one jaw side, while the contralateral side presented by 24 AT without magnets; B) 24 patients in whom magnets were placed around 48 AT on both sides of a mandibular OD. The control group comprised 20 individuals with healthy dental arches, each with one pair of canines/premolars (a total of 40 teeth). All patients were followed for one year, with the assessment of the plaque index (PI; Silness & Loe) and the gingival index (GI; Loe & Silness). Significant decrease of PI and GI values was noted in the EG subgroup B between the base time point [PI = 0.875 (0.4687-1.0312), GI =1.000 (0.359-1.578)] and 12 months recall (PI = 0.375 (0.2500-0.7500), GI = 0.750 (0.187-1.156)] ($P < 0.01$ in both cases).
Conclusion: The inserted magnets of OD significantly improved PI and GI values around experimental abutment teeth after 12 months. (**International Journal of Biomedicine. 2026;16(3):383-387.**)

Keywords: overdenture • magnet • plaque index • gingival index • long-term study

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Introduction

The acrylic resin overdenture (OD) prosthesis is an appropriate treatment for partially edentulous patients who have a small number of remaining teeth with poor periodontal prognosis.[1] The remaining teeth for OD must be adequately prepared to achieve better adhesion than with conventional dentures.[2,3] The additional retention for OD is nowadays achieved by dental implants as the standard protocol in prosthetic rehabilitation. Furthermore, remaining teeth that are properly positioned and sufficiently stable can serve as abutments for telescopic (double) crowns, particularly when there is a high risk of osteoporosis.[4]Although ODs have been widely used, meaningful clinical problems are still related to the periodontal disease [5,6] as well as jaw osteoporosis.[7,8] With that in mind, some authors have attempted to apply a magnetic field (MF) to prevent alveolar bone loss after tooth extraction [5,9] a finding recently confirmed in bone and cartilage tissues.[10] The promising studies on the animal models [11-13] as well as human [14] regarding periodontal tissue preservation directed the aim of this study to measure the influence of MF on the periodontal health of abutment teeth (AT) under OD, comparing the

periodontal indices' values between abutment teeth with and without magnets. The null hypothesis was that periodontal tissues around teeth adjacent to magnets inserted into ODs have a periodontal health status similar to that of the control teeth (without magnets) beneath overdentures.

Materials and Methods

The Study Protocol

The 136 vital lower canines/premolars of patients were included in the study. Experimental group (EG) involved 48 subjects with maximally reduced tooth number, 96 abutment teeth overall, assuming two subgroups: A) split mouth samples of 24 patients/24 teeth with magnets inserted in denture base around AT on one jaw side, while the contralateral side presented by 24 AT without magnets; B) 24 patients in whom magnets were placed around 48 AT on both sides of a mandibular OD. The control group comprised 20 individuals with healthy dental arches, each with one pair of canines/premolars (a total of 40 teeth). All patients were followed for one year, with the assessment of the plaque index (PI; Silness & Loe) and the gingival index (GI; Loe & Silness).[15]

Before the study, patients were trained to follow an adequate oral hygiene regimen. This study included only lower canine/premolar abutments, which in EG showed poor periodontal status and reduced alveolar bone. Participants had to agree to wear the dentures continuously during the daytime and refrain from wearing them at night. All dentures were fabricated in the laboratory (Clinic of Dental Prosthetics, School of Dental Medicine, Belgrade University) by the same dental technicians using standardized materials and methodology. The measurements were taken by the same person (the first author of the study).

Magnets' Insertion into the Patient's Overdentures

Acupuncture micromagnets (AKMA R, Institute of Mihajlo Pupin, Belgrade, Serbia) were incorporated into the bases of the ODs (Fig 1) near the remaining AT with casting caps (Fig 2). All AT had metal copings that met the well-fitting criteria. Magnets were implanted at the beginning of the study. The used static magnet discs were spherical and consisted mostly of barium ferrite, with a concentrated magnetic flux density of 60 mT, attested by the Military Medical Academy, Belgrade (attest number: 1600-2/83). Magnet discs were plan-convex in shape, with a diameter of 3.0 mm and a height of 1.4mm. The subjects were assessed for periodontal health status to determine the PI and GI. According to the manufacturer's data (Mihajlo Pupun Institute), magnets exposed the biological homogeneous field with an effect of 5.0 mm along the axis and 8.0 mm to the sides. The plain surface of the magnet disc (south pole) was inward oriented, and the convex surface (north pole, i.e., therapeutic pole) outward to the gingival tissue. There would be no harmful magnetic influence due to the following of the International Commission on Non-Ionizing Radiation Protection (ICNIRP) parameters.[16] The index recordings were performed by the same operator at baseline and 12 months after magnet insertion. The PI value was measured after patients rinsed their mouths and dried (standard erythrosin disclosing tablets, Buttler Gum toothbrush, Sunstar Americas Inc., Chicago, USA). Dental plaque was detected by dental probe graded from 0 to 3 according to the following criteria: 0 - no dental plaque at the gingival third of the tooth crown; 1 - dental plaque present in very thin layers close to the gingival margin visible only by disclosing tablet; 2 - moderate presence of plaque in the gingival sulcus/pocket - visible by naked eye and 3 - large amount of dental plaque by completely saturated gingival sulcus/pocket and interdental space. The GI was characterized by the following values: 1 (0.1 to 1.0) - insignificant; 2 (1.1 to 2.0) - moderate, and 3 (2.1 to 3.0) - intensive gingival inflammation.

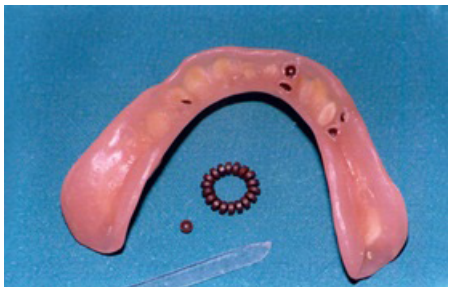

Fig. 1. *Suitable position of magnets in the OD base.*

Fig. 2. *Abutment teeth prepared with casting caps.*

Statistical analysis was performed using SPSS Statistics for Windows, Version 11.5 (SPSS Inc., Chicago, IL). The results are presented as median (Me) and interquartile range (IQR [Q1; Q3]). A nonparametric repeated-measures ANOVA was used. A *P*-value <0.05 was considered statistically significant.

Results

PI values decreased significantly after 12 months in Subgroup B ($P<0.01$), but in Subgroup A, PI values increased insignificantly ($P>0.05$) (Table 1).

Table 1.

Plaque index values in the study subgroups at baseline and after 12 months.

	Baseline	12 months after	*P*-value
Subgroup A	0.632 (0.4531-1.2343)	0.687 (0.3125-0.9687)	>0.05
Subgroup B	0.875 (0.4687-1.0312)	0.375 (0.2500-0.7500)	<0.01

GI values showed similar changes. A statistically significant decrease after 12 months was observed in Subgroup B ($P<0.01$), whereas in Subgroup A, the PI value showed an insignificant increase ($P>0.05$) (Table 2).

Table 2.

Gingival index values in the study subgroups at baseline and after 12 months.

	Baseline	12 months after	*P*-value
Subgroup A	1.37 (1.118-1.625)	1.12 (0.687-1.484)	>0.05
Subgroup B	1.000 (0.359-1.578)	0.750 (0.187-1.156)	<0.01

Discussion

The study we conducted is somewhat unique, as it used the stated methodology of inserting magnets into the OD base and examining their effects on abutment tissues. Namely, the present study demonstrated that the magnetic field (MF) has a beneficial effect on periodontal tissues surrounding OD-worn teeth, as evidenced by more favorable PI and GI index values after 12 months in patients in whom magnets were placed around 48 AT on both sides of a mandibular OD. Thus, exposure to a constant MF has a positive effect on the two indicators of periodontal tissue status investigated. However, this improvement could be explained not only by the magnet›s influence but also by the combined effect of prior education on oral hygiene among the patients.

This study was inspired by the promising results of bioelectrical potential in bone tissue reported by Dr. Zachary Bert Friedenberg in 1966. Since then, many researchers have begun to examine the magnetic influence on various osteopathological entities.[14,17-19] ODs were chosen for this study instead of classical full /partial dentures due to their well-known positive effect on the periodontal tissue.[1-6] The encouragement of micromagnet implementation in the denture base led to positive results in our microbiological study, given its bacteriostatic effect.[20]

Due to the decrease in MF with distance to the third power ($1/r^3$), our magnet discs were inserted into the acrylic base as close as possible to the gingival tissue to achieve better results.

To the best of the authors' knowledge, this is the first study in the literature to investigate the influence of MF on periodontal health under OD. Thus, the results of the present study cannot be compared with those of similar studies. According to (WHO) standards [16] defined by ICNIRP, the MF obtained was classified as «safe» for human tissue treatments with no consequences for an indefinite period. Advantages of static over variable MF include easier control over a continuum, greater power stability, and no need for subject check-ups.

As the patients were highly motivated to preserve their remaining teeth, they eagerly accepted this treatment and underwent regular check-ups over the 12-month period. It is emphasized that there were no cases of fractured OD during the study, owing to the small dimensions of magnets precisely incorporated into the denture base. Dentures were fabricated at the University Clinic for Prosthodontics by the same person, a senior, very skilled technician, using conventional materials. This uniformity enabled a reliable statistical analysis of the data.

Low PI is explained by the reduction in microbes under MF in this study, as confirmed in our recent microbiological study.[20] Favorable GI under MF might be due to the accelerated metabolism of both inflamed and healthy tissues. Namely, the permeability of the cell membrane is increased, and so is cell metabolism.[11,22] More precisely, a beneficial bacteriostatic effect and improved vascularisation of tissues beneath the OD are also observed.

As the findings of the clinical periodontal indices/ tests were favorable, indicating improvement in PI and GI, the clinical procedure of this experiment, i.e., the insertion of magnets into OD, should be applied in everyday dental practice.

The results of some longitudinal [3,5] and our studies [19] should encourage investigators to apply MF in the oral environment and to use it for alveolar bone preservation for longer than one year, especially where remaining teeth are present. However, the literature suggests that magnets may not substitute for antibiotics in the treatment of bacterial infections in some dental treatments and adjunct periodontal surgery.

Moreover, we should keep in mind the upcoming technologies for measuring periodontal tissue load. Hence, the relatively new technique, the stereooptics method, was used to evaluate the resistance of periodontal supporting tissues around remaining teeth under OD. Namely, some authors used that model to study the distribution of occlusal stress on casts of a partially edentulous lower jaw with copings, yielding highly precise data using the digital image correlation method and ARAMIS software.[21]

Bearing in mind the huge increase in the use of implants under the overdenture, the finite element-simulated method on the newly designed model showed that the new design of customized mandible implant (sinewave plate), which showed an advantage over the standard method, could also be a novelty for application in prosthetic science, commonly used straight implant design regarding periodontal tissue condition.[22]

Overall, the results on periodontal condition relied on standardized indices and tests and may be considered reliable. In this study, it was expected that the periodontal condition of the teeth under OD prostheses would remain the same or even worsen after 1 year of therapy. However, PI and GI values around the teeth without MF influence were higher than expected, as reported in Tables 1 and 2. Moreover, teeth under static MF influence remained stable in their alveoli, with a favorable periodontal status, indicating long-term survival.

Conclusion

The null hypothesis that tissues adjacent to magnets had the same periodontal health as teeth without magnets was rejected, as MF showed a positive influence on PI and GI around remaining abutment teeth after 12 months following AT

with magnets. Hence, the presence of the static MF enhances the strength and resistance of periodontal supporting tissues around remaining teeth under OD. Additional use of magnets with OD is a simple, safe procedure widely accepted by patients and should be recommended to preserve the alveolar bone and stimulate other supporting tissues.

Clinical Implications

The results of this study showed beneficial effects of the magnetic field (improved periodontal indices) beneath the partial overdenture around preserved remaining teeth. The recommendation for the geriatric population is obvious: to include the remaining teeth, even with a poor periodontal prognosis, to reshape them and keep them as abutment teeth for a further overdenture with magnets inserted into their bases.

Author Contributions

Snežana V. Brković: Conceptualization, Methodology, Investigation, Data curation and interpretation, Writing – original draft.
Srđan D. Poštić: Investigation, Data curation and interpretation, Writing – review and editing.
Veljko D. Ilić: Data curation and interpretation, Writing – original draft.
Branimir D. Stošić: Data curation and interpretation
Pavle D. Ilić: Investigation, Data curation, Writing – review and editing.
All authors have approved the final article.

Ethical Statement

With the patients' written consent for the study, approval was obtained from the Ethics Committee of the School of Dental Medicine, Belgrade University (protocol number 572/1).

Conflict of Interests

The authors have declared no conflict of interest.

Statement of Generative AI Use

AI was not used in this study.

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