

CASE STUDIES STUDII DE CAZ

Complex oral rehabilitation in an elderly patient with periodontal disease who exercises regularly Reabilitarea orală complexă la o pacientă vârstnică, care prestează regulat exerciții fizice și care prezintă parodontopatie de senescență

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Abstract

Background. Physical exercise, balneoclimatic procedures, as well as the maintenance of individualized local hygiene conditions have been proven to be favorable to health even at advanced ages when these are kept within tolerance limits, having a beneficial impact not only on the general health but also on periodontal tissues.

Aims. The increase of the mechanical strength of teeth involves providing periodontal support adapted to composite restoration treatment, as well as improving the facial appearance, which plays a role in increasing the patient's quality of life.

Material and method. This paper presents a complex oral rehabilitation programme, evidencing periodontal disease and its therapy at an advanced age, in the case of a person who exercises regularly, a former high-performance skier.

Results. Senescent periodontal involution can develop within functional limits (absence of inflammation and tooth mobility), in the context of a healthy lifestyle, which includes: antioxidants, physical exercise, individualized oral hygiene through the use of auxiliary hygiene means, etc.

Senescent periodontal involution allowed us to perform complex individualized oral rehabilitation, with a role in reinforcing dental-periodontal support, with excellent clinical results.

Conclusions. The fact that the patient still exercises regularly, attends balneoclimatic therapy and strictly observes the diet prescribed by nutritionists continuously provides her with antioxidant intake offering a visible impact, including regarding periodontal tissues.

Taking into account geriatric dental particularities, adequate periodontal and prosthetic treatment by stages associated with patient compliance can lead to positive results, consisting of a long-term improvement of quality of life.

Key words: periodontal involution, senescence, prosthetic treatment, oral rehabilitation, physical exercise.

Rezumat

Premize. Exercițiile fizice, procedurile balneo-climaterice, cât și respectarea condițiilor locale de igienă individualizată se dovedesc a fi favorabile stării de sănătate, chiar și la vârste înaintate, atunci când acestea se realizează în limite de toleranță, având un impact benefic asupra sănătății, inclusiv asupra structurilor parodontale.

Obiective. Creșterea rezistenței mecanice a dinților are în vedere realizarea unui suport parodontal adaptat pentru un tratament protetic în sistem compozit, cât și îmbunătățirea fizionomiei la nivel local, aceste detalii având rolul de a crește calitatea vieții.

Metode. Lucrarea de față prezintă o variantă de reabilitare orală complexă cu evidențierea afecțiunilor parodontale, terapia acestora la vârsta a III-a, în cazul unei persoane care prestează exerciții fizice cu regularitate și care în antecedente a practicat schi de performanță.

Rezultate. În ceea ce privește involuția parodontală de senescență, ea se poate instala în limite funcționale (lipsa inflamației și a mobilității dentare), în contextul unui stil de viață sănătos, care include: practicarea regulată a exercițiilor fizice, menținerea unei igiene orale individualizate prin utilizarea mijloacelor auxiliare de igienă, aportul constant de antioxidanți etc. Involuția parodontală de senescență ne-a oferit posibilitatea realizării unei reabilitări orale complexe individualizate, cu rol de consolidare a suportului dento-parodontal și cu rezultate clinice excelente.

Concluzii. Având în vedere că pacienta prestează regulat exerciții fizice cu intensitate moderată, tratamente balneo-climaterice și respectă cu stictete un regim alimentar impus, alcătuit în colaborare cu specialiști în nutriție, toate acestea îi oferă în permanență un aport de antioxidanți cu impact vizibil inclusiv asupra parodontiului.

Respectarea elementelor de geriatrie stomatologică, respectarea etapelor de tratament parodontal și protetic, însoțite de complianța pacientei, pot oferi rezultate pozitive legate de creșterea calității vieții pentru perioade lungi de timp.

Cuvinte cheie: involuție parodontală, senescență, tratamente protetice, reabilitarea orală, exerciții fizice.

Received: 2016, February 21; *Accepted for publication:* 2016, March 20;

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Introduction

Periodontal disease due to senescence is frequently found in dental care services. Therapeutic approaches vary depending on the degree of tooth mobility, response to local therapy, the number and position of residual teeth, the patient's general health status and compliance with treatment.

The permanent concern about health involves a continuous fight starting with adult age, particularly at older age. In this sense, moderate physical exercise, a diet including fibers and antioxidants, balneoclimatic procedures, individualized oral hygiene, avoidance of vicious habits with a negative impact on health must be adopted and adjusted to the needs of each individual (Crăciun, 2015; Albu & Lupu, 2015; Onose et al., 2015; Schwartz et al., 2012; Mureșan, 2015; Surdu et al. 2015). At the same time, general disorders that can be due to the presence of periodontopathogenic bacteria in the case of elderly patients who do not maintain adequate oral hygiene should be taken into consideration. There are studies that demonstrate a predisposition to arterial stiffness, myocardial infarction, coronary heart disease, chronic obstructive pneumonia, etc. (Kapellas et al., 2014; Eberhard et al., 2014; Cueto et al., 2005; Wood & Johnson, 2005; Uneo et al., 2012; Si et al., 2012). Periodontal changes in elderly patients who do not meet these quality of life requirements are most of the time associated with periodontal pockets, tooth mobility, bleeding on periodontal probing.

The correlations between periodontal disease and advanced age are closely related to the lifestyle described above. The predisposition to certain periodontal disorders increases in time due to cumulative effects of the disease activity stages (Kuo et al., 2008).

Periodontal senescence (involution) is due to degeneration of connective tissue and collagen fibers, as well as to an atrophy of alveolar bone, which decreases in volume due to medullary bone with an increase of bone density. Under these circumstances, elderly patients who maintain adequate oral hygiene, adapted to local requirements, frequently have teeth with an elongated crown and a shortened root because of periodontal tissue involution; there is no pathological tooth mobility and the marginal gingiva is normally colored (Dumitriu et al., 2009).

Exclusion of vicious habits with a negative impact on the periodontium, as well as acceptance of individualized oral rehabilitation significantly improves the chances of maintaining an optimal periodontal status for long time periods (Waszkiewicz et al., 2013; D'Agostini et al., 2013; Lung, 2007).

Objectives

To evidence the presence of teeth with senescent periodontal involution, without pathological mobility, in the absence of osteoporosis due to antioxidant intake resulting from diet, moderate physical activities, as well as balneoclimatic procedures.

To demonstrate the presence of teeth with senescent periodontal involution, without periodontal pockets at an advanced age, under the conditions of individualized oral

hygiene.

The possibility of dental restoration supported by teeth with senescent periodontal involution, when these do not show pathological mobility.

Hypothesis

This study aims to highlight the relationship between senescent periodontal involution in elderly patients and a lifestyle that includes individualized oral hygiene, moderate-intensity physical exercise, balneoclimatic procedures and an antioxidant diet.

Material and methods

This case study was approved by the Ethics Committee of the Iuliu Hațieganu University of Medicine and Pharmacy Cluj-Napoca, and the subject's informed consent was obtained.

Research protocol

a) Period and place of the research

On 16.09.2015, the patient presented to the dental office for complex oral rehabilitation, which was carried out until 25.11.2015.

b) Subject

History

Patient CV, aged 78 years, has an active lifestyle, being a former high-performance athlete. After the age of 50, the patient has practiced moderate-intensity sports activities and has attended spa treatments, within the limits of her health condition and the requirements of her treating doctor. She follows a diet established by a nutritionist, which includes antioxidants (Biha & Biha, 2015; Boșca, 2014; Mendoza-Núñez et al., 2014; Bawadi et al., 2011; Shimazaki et al., 2010).

At the time of presentation, the patient reported no chronic or acute general disorders, no allergies or osteoporosis; medication administered over a certain period of the year was based on vitamin therapy indicated by her family doctor.

The patient lost her maxillary front teeth in a ski accident at the age of 54; following the impact, the central incisors were expelled and the lateral incisors and the canines were fractured. The fractured teeth required immediate extraction. No soft tissues were lost following the impact. The rest of the teeth were lost as a result of caries complications. On 16.09.2015, the patient had six teeth present in the mandible.

c) Tests applied

Examination of the mucosa

The mucosa was supple, elastic, pink, without clinically detectable pathological changes.

Examination of the salivary glands

The salivary glands were permeable and there was a sufficient amount of saliva; there was no current or past history of hyposaliva, xerostomia or hypersialia.

Prosthetic diagnosis

Maxillary – total edentation restored by removable full acrylic denture.

The total edentulous prosthetic field appeared as follows:

- broad edentulous ridge of medium height; neutral external side; smooth, semi-elliptical shape of the edentulous ridge;

- both maxillary tuberosities were non-retentive, and the sides were neutral and parallel to each other;
- the palate did not show an obvious torus palatinus requiring an adjustment of the treatment plan, and it had a slightly flat shape and a large size.

The entire surface of the prosthetic field was covered with a thick, well-vascularized mucosa, adherent to the periosteum, having a hard appearance.

Mandibular-T-A-T edentation (COSTA's classification) restored with fixed dentures (Popa, 2001a):

The patient clinically presented the following characteristics (Fig. 1):

- metal (Gaudent) FPD in 3.6-3.5-3.4
- acrylic FPD in 3.3-3.2-4.2-4.3
- acrylic FPD in 4.4-4.5

The acrylic bridges had no metal components, being recommended only for provisional purposes, and were radiotransparent (Popa, 2001b).

Dental and endodontic diagnosis

The teeth under the bridge body showed:

- 3.6 – crown and root destruction, with dental root separation and apical reaction in the mesial root
- 3.5 – crown destruction of carious etiology
- 3.4 – treated endodontically
- 3.3 – deep caries lesion under the bridge body and pulp hyperemia (Gafar & Iliescu, 2005)
- 4.2; 4.3 – residual roots of carious etiology
- 4.4 – underwent apical resection about 20 years before
- 4.5 – occlusal caries under FPD.

Periodontal diagnosis

Regarding periodontal disease, in this case senescent involution was found, which is characterized by gum-bone recession in some teeth, with an inverse crown-root ratio, the marginal gum showing a normal color, and tooth mobility was within physiological values.

- *The degree of gingival recession* – due to periodontal involution, 4 mm horizontal gingival recession was present in all teeth and all dental surfaces.

Given that all teeth were covered by FPD, the degree of gingival recession was calculated from the limit of the FPD neck to the free gingival margin, except for 4.3.;4.2., for which determinations could not be performed because of carious destruction.

- *The bacterial plaque index* – 1; bacterial plaque was seen on tooth surfaces only after scraping with the tip of the probe (Silness and Løe classification).

Bacterial plaque retention was favored by gum-bone involution and the FPD margins that had become inadequate because of their old age, as well as due to the inappropriate material used for a long-term FPD in the front mandibular region and in the fourth quadrant.

- *The calculus index* - 0 – no calculus (Dumitriu et al., 2009).

- *The gingival bleeding index* – 0 – absence of bleeding (MÜHELMANN's classification).

Tooth mobility

It was assessed using dental tweezers, by exerting moderate pressure in a horizontal plane and in an axial direction.

- 3.6, 3.5, 3.4, 3.3, 4.2, 4.3, 4.4, 4.5 - gr. 0 mobility, "physiological mobility" (Lung, 2007);
- 3.2 - gr. III mobility (Dumitriu et al., 2009; Lung,

2007), was a retainer of the acrylic FPD in the lower front region, maintaining four acrylic teeth along with 3.3 in cantilever, because of the carious crown-root destruction of teeth 4.2;4.3, which could no longer support the bridge body.

Probing depth

Probing of the teeth was performed in six surfaces for each tooth: mesiovestibular, midvestibular, distovestibular, distolingual, midoral, mesiolingual. Clinical probing depth was up to 1.5 mm.



Fig. 1 – Preliminary panoramic dental X-ray. During the X-ray, the patient had acrylic FPDs in 3.3-3.2-4.2-4.3, and 4.4-4.5, which are radiotransparent.

The patient had good oral hygiene, and the last treatments were performed about 15 years before.

Results

The treatment plan

The therapeutic scheme did not include dental implant placement because of the patient's limited financial resources.

The following were performed:

1. Cleaning of the oral cavity: scaling, removal of old FPDs, extractions of teeth 3.6, 3.2, 4.2, 4.3.
2. Filling of the crown of tooth 4.5 with glass ionomer filling material (Ketac).
3. Endodontic treatment for teeth 3.3; 3.5; restoration of endodontic treatment for tooth 3.4 (Gafar & Iliescu, 2005).

Unlike the great majority of elderly persons, in this case the patient had no problems tolerating the rubber dam, which caused no respiratory difficulties; the endodontic obturation was performed using the cold vertical-lateral condensation technique.

4. Teeth 3.5; 3.4; 3.3; 4.4 were reinforced with glass fiber posts luted with a dual-cure resin-based cement, from which the prosthetic stumps were made, without biological width being affected (Gligor & Gligor, 2012; Dinu, 2010) (Fig. 2).



Fig. 2 – Photo image following reconstruction of prosthetic stumps by reinforcement of glass fiber posts in teeth 3.5; 3.4; 3.3.

Observation

The crown destruction of the teeth that were maintained did not extend subgingivally; residual supragingival tooth margins were more than three millimeters (Dinu, 2010).

We emphasize the fact that residual teeth did not show mobility following FPD ablation (except for 3.2) or probing depth – "a clinical value of up to 2 mm on probing is considered physiological".

Prosthetic treatment included:

- Fixed denture restoration

In residual teeth, metal-ceramic FPDs joined at the point of contact, which also play a role in additional tooth stabilization, were made.

It is extremely important in such cases to protect the marginal periodontium and to create cervical embrasures for adequate cleaning, as well as to strictly follow all details and stages of the fabrication of metal-ceramic FPDs.

A Cr-Co alloy was chosen due to its hardness, and ceramic was selected for its chromatic, mechanical, dimensional stability and also, for its structure, which does not undergo changes in time.

- Removable denture restoration

It consisted of two classic removable dentures with a Flexite base and ceramic teeth. The mandibular removable partial denture was anchored by the residual teeth restored using a metal-ceramic FPD by means of wings, which are extensions of the Flexite denture base and establish dentomucosal contacts with the tissues, and at the same time protect the marginal periodontium due to foliation performed at this level (Fig. 3a,b).

Flexite used as a base for removable partial dentures provides clearly superior resistance and reliability compared to acrylic resins, the risk of fracture and porosity being much lower. At the same time, color is much more stable in time and thickness can be significantly more reduced.

The ceramic teeth of the denture had the same dimensional and chromatic characteristics as those of the fixed denture prosthesis.



Fig. 3 – Photo images taken at the end of treatments. Image **b** shows a normal color of the marginal gingiva in 3.3; 4.4-4.5, with the anchored removable denture.

The periodontal status accompanied only by senescent involution, considering the absence of tooth mobility after FPD ablation, is due to a healthy lifestyle maintained through individualized oral hygiene, physical exercise, balneoclimatic treatments, dietary antioxidant intake; unlike other periodontal disorders, it appears as a factor favorable to prosthetic restoration under optimal local treatment conditions, when the general health status allows it.

The absence of periodontal pockets in this case is due to individualized oral hygiene, as well as to antioxidant effects resulting from moderate-intensity physical exercise, diet established by the nutritionist, and balneoclimatic procedures.

Additional reinforcement of residual teeth covered with metal-ceramic FPDs provides adequate additional support for the stabilization of a removable partial denture under optimal conditions.

Discussions

The 78-year-old patient had gum-bone recession in the residual teeth, and gingival inflammation proved to be clinically occult (Roman et al., 2008). The patient maintained adequate oral hygiene, which reduced many other risks caused by periodontopathogenic bacteria, such as: arterial stiffness, coronary heart disease, chronic obstructive pneumonia, etc. (Ueno et al., 2012; Si et al., 2012; Kapellas et al., 2014; Cueto et al., 2005; Wood & Johnson, 2005; Eberhard et al., 2014).

The patient's favorable periodontal status was due to individualized local hygiene, dietary antioxidant intake, physical exercise, and balneoclimatic procedures. There are studies demonstrating the presence of salivary antioxidants in elderly patients who perform physical exercise (Mendoza-Núñez et al., 2014; Hayashida et al., 2009) and also, studies that demonstrate the association of periodontal disease with a low level of physical activity and inadequate nutrition (Bawadi et al., 2011).

The presence of teeth with senescent periodontal involution that allowed periodontal, endodontic and prosthetic treatments provided a real support for the mandibular removable partial denture, significantly improving the quality of life of this patient (Ravald & Johansson, 2012).

The availability of mandibular periodontal support, as well as the favorable anatomical structure of the palate enabled complex oral rehabilitation close to the initial esthetic appearance of the patient's physiognomy (Fig. 4) (Armean & Rotaru, 2014).

Senescent involution did not require extraction, because the teeth were not mobile, representing a very important support for the mandibular denture. It is known that removable dentures in the mandible most frequently have precarious stability because of the reduced supporting surfaces and not least, the fact that the mandible is a mobile bone should be taken into account.

Regarding the maintenance of local periodontal status, the patient was aware of the need for long-term maintenance sessions for prevention of periodontal disease and early identification of problems, as well as for immediate initiation of antiinflammatory and biomechanical treatment if needed. The patient's visits to the dental office every six months will maximize the possibility of maintaining her natural teeth under optimal conditions of health, comfort, esthetic appearance and functionality during the entire course of her life.

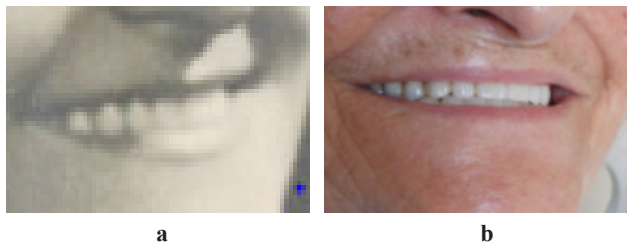


Fig. 4 – Comparison of initial physiognomic appearance with the final therapeutic result.

This periodontal status enabled composite restoration, performed after surgical, endodontic and dental treatments (Waszkiewicz et al., 2013; D'Agostini et al., 2013; Lung, 2007). Elderly persons who do not meet these quality of life requirements most frequently have periodontal pockets, bleeding on probing and tooth mobility.

Conclusions

1. Preserving the biological space of the marginal periodontium, by correctly positioning the limits of FPD and the margins of the removable partial denture, as well as correctly placing the points of contact allows to maintain a healthy periodontium.

2. The patient's adequate lifestyle in terms of dietary antioxidant intake, regular moderate-intensity physical exercise, balneoclimatic procedures, avoidance of vicious habits, appropriate hygienic means significantly improved the patient's chances of a favorable periodontal prognosis.

3. Providing additional support by immobilization of teeth with senescent periodontal involution, through a metal-ceramic FPD in this case, ensures much stronger periodontal support for a composite restoration treatment plan.

4. Endodontic treatments in the case of the patient's teeth with senescent periodontal involution add to the therapeutic results with an impact on periodontal structures, given the terminal vascularization of the teeth.

Conflicts of interests

There are no conflicts of interests.

Acknowledgments

This article uses partial results from the first author's doctoral thesis, which is in progress at the Iuliu Hațieganu University of Medicine and Pharmacy, Cluj-Napoca, Romania.

References

Albu A, Lupu D. Adipokinele, inflamația sistemică și exercițiul fizic. *Palestrica Mileniului III-Civilizație și Sport*, 2015;16(3):257-261.

Armean MI, Rotaru H. Morfologia facială în opera picturilor renascentiste. *Bul inf Med Dent*, 2014;3:20-35.

Bawadi HA, Khader YS, Haroun TF, Al-Omari M, Tayyem RF. The association between periodontal disease, physical activity and healthy diet among adults in Jordan; *Periodontal Res*. 2011;46(1):74-81. doi: 10.1111/j.1600-0765.2010.01314.x.

Biha NC, Biha Ș. The balneary treatment course- a breath of life.

Balneo Res J, 2015;6(3):176-179.

Boșca AB, Dinte E, Ilea A, Pârvu AE. Efectele terapeutice ale extractelor vegetale cu proprietăți antioxidante în managementul bolii parodontale. *Transilvania Int Congress Dent Cluj-Napoca*, Vol. 9-11 Oct. 2014.

Crăciun MD. Improving the quality of life in climax with kinetotherapy and natural factors in Vatra Dornei resort. *Balneo Res J*, 2015;6(2):122. DOI: <http://dx.doi.org/10.12680/balneo.2015.1095>.

Cueto A, Mesa F, Bravo M, Ocaña-Riola R. Periodontitis as risk factor for acute myocardial infarction. A case control study of Spanish adults. *J. Periodontal Res*. 2005;40(1):36-42.

D'Agostini F, Calcagno E, Micale RT, La Maestra S, De Flora S, Cingano L. Cytogenetic analysis of gingival epithelial cells, as related to smoking habits and occurrence of periodontal disease. *J Hyg Environ Health*. 2013;216(1):71-75. doi:10.1016/j.ijheh.2012.01.005.

Dinu C. Alungirea coroanei clinice în scop restaurativ: posibilități, indicații, limite. *Bul inf med dent*. 2010;2:7-11.

Dumitriu HT, Dumitriu S, Dumitriu AS. *Parodontologie*. (Ed aV-a). Ed. Viața Medicală Românească, 2009.

Eberhard J, Stiesch M, Kerling A, Bara C, Eulert C, Hilfiker-Kleiner D, Hilfiker A, Budde E, Bauersachs J, Kück M, Haverich A, Melk A, Tegtbur U. Moderate and severe periodontitis are independent risk factors associated with low cardiorespiratory fitness in sedentary non-smoking men aged between 45 and 65 years; *Clin Periodontol*. 2014;41(1):31-37. doi: 10.1111/jcpe.12183.

Gafar M, Iliescu A. *Endodonție clinică și practică*. Ed. Med București, 2005.

Gligor AC, Gligor D. Posibilități de reconstrucții estetice după traumatisme dentare la sportivi-prezentare de caz. *Palestrica Mileniului III- Civilizație și Sport*. 2012;13(1):44-47.

Hayashida H, Kawasaki K, Yoshimura A, Kitamura M, Furugen R, Nakazato M, Takamura N, Hara Y, Maeda T, Saito T. Relationship between periodontal status and HbA1c in nondiabetics. *J Public Health Dent*. 2009;69(3):204-206. doi: 10.1111/j.1752-7325.2009.00122.x.

Kapellas K, Jamieson LM, Do LG, Bartold PM, Wang H, Maple-Brown LJ, Sullivan D, O'Dea K, Brown A, Celermajer DS, Slade GD, Skilton MR. Associations between periodontal disease and cardiovascular surrogate measures among Indigenous Australians. *Int J Cardiol*. 2014;173(2):190-196. doi: 10.1016/j.ijcard.2014.02.015.

Kuo LC, Polson AM, Kang T. Associations Between periodontal diseases and systemic diseases: A review of the inter-relationship and interactions with diabetes and osteoporosis. *J Royal Inst Pub Health*. 2008;122 (4):417-433.

Lung T. *Parodontologie clinică*. Ed. Napoca Star Cluj-Napoca, 2007.

Mendoza-Núñez VM, Hernández-Monjaraz B, Santiago-Osorio E, Betancourt-Rule JM, Ruiz-Ramos M. Tai Chi exercise increases SOD activity and total antioxidant status in saliva and is linked to an improvement of periodontal disease in the elderly. *Oxid Med Cell Longev*. 2014;2014:603853. doi: 10.1155/2014/603853.

Mureșan ML. Comparative analysis of Călimănești-Căciulata and Techirghiol in terms of tourism development of medical rehabilitation. *Balneo Res J*, 2015;6(2):98-105.

Onose G, Haras MA, Sinescu CJ et al. Basic wellness features and some related actions, propensive including for active and healing ageing. *Balneo Res J*, 2015;6(2):108. DOI: <http://dx.doi.org/10.12680/balneo.2015.1095>.

Popa S. *Protetică dentară. Formele clinice ale edentației parțiale și planul de tratament prin punți dentare*. Ed. Med SA, București, 2001a.

Popa S. *Protetică dentară. Tratatamentul edentației parțiale prin*

- punți dentare. Ed. Med SA, București, 2001b.
- Ravald N, Johansson CS. Tooth loss in periodontally treated patients. A long-term study of periodontal disease and root caries. *J Clin Periodon.* 2012;39(1):73-79. doi: 10.1111/j.1600-051X.2011.01811.x.
- Roman ARC, Popovici A, Vitiuc I. Ghid teoretic și clinic de parodontologie. Ed. Med Univ „Iuliu Hațieganu”, 2008.
- Schwartz N, Kaye EK, Nunn ME, Spiro A 3rd, Garcia RI. High-fiber foods reduce periodontal disease progression in men aged 65 and older: the Veterans Affairs normative aging study/ Dental Longitudinal Study. *J Am Geriatr Soc.* 2012;60(4):676-683. doi: 10.1111/j.1532-5415.2011.03866.x.
- Shimazaki Y, Egami Y, Matsubara T, Koike G, Akifusa S, Jingu S, Yamashita Y. Relationship between obesity and physical fitness and periodontitis; *J Periodontol.* 2010;81(8):1124-1131. doi:10.1902/jop.2010.100017.
- Si Y, Fan H, Song Y, Zhou X, Zhang J, Wang Z. Association between periodontitis and chronic obstructive pulmonary disease in a Chinese population. *Periodontol.* 2012;83(10):1288-1296.
- Surdu O, Surdu TV, Surdu M. State of art of balneotherapy/thermalisme in Romania. *Balneo Res J,* 2015;6(2):86-91.
- Ueno M, Izumi Y, Kawaguchi Y, Ikeda A, Iso H, Inoue M, Tsugane S, JPHC Study Group. Prediagnostic plasma antibody levels to periodontopathic bacteria and risk of coronary heart disease. *Heart J.* 2012;53(4):209-214.
- Waszkiewicz N, Chojnowska S, Zalewska A, Zwierz K, Szulc A, Szajda SD. Salivary hexosaminidase in smocking alcoholics with bad peiodontal and dental states. *Drug and Alcohol Dependence.* 2013;129(1-2):33-40. doi:10.1016/j.drugalcdep.2012.09.008.
- Wood N, Johnson RB. Recovery of periodontopathogenic bacteria from embalmed human cadavers; *Clin Anat.* 2005;18(1):64-67.