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A Nonsurgical Treatment for Early Peri-Implantitis Using Mechanical, Antiseptic and Anti-Inflammatory Treatment

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ABSTRACT

Purpose: *The aim of our study is to evaluate the effectiveness of Armenicum paste in the conservative treatment of early peri-implantitis.*

Methods: *This is a blinded RCT clinical prospective study of 47 patients diagnosed with early peri-implantitis who were treated from 2023 to 2025.*

Study population: *The patients' age ranged from 32 to 64 years; 25 men and 22 women were included. The diagnosis of peri-implantitis was confirmed taking into account, indicators of bleeding on probing (BOP) > 20%, probing depth (PD) ≥ 4 mm, radiological signs of bone loss (MBL) ≥ 1 m. The study adheres to the CONSORT guidelines.*

According to the selected treatment method, patients were randomly divided into two groups:

Group A (24 patients - 13 men and 11 women), 29 implant treatments included mechanical implant cleaning with titanium or plastic-curets, Air-Flow Perio Soft, irrigation of the circus-pocket with 0.12% chlorhexidine, additional use of local "Armenicum", past 10 days, and systemic antibiotics (amoxicillin 500mg and metronidazole) all the above antibiotics were administered per with duration of 7 days.

Group B (23 patients - 10 men and 13 women), 28 implant treatments included mechanical implant cleaning with titanium or plastic-curettes, Air-Flow Perio Soft, irrigation of the circus-pocket with 0.12% chlorhexidine, and systemic antibiotics (amoxicillin 500mg and metronidazole) all the above antibiotics were administered per with duration of 7 days. The patient was under dynamic control, and professional hygiene was carried out.

To assess the effectiveness of treatment, the following clinical parameters were used:

1. Bleeding on probing (BOP);

2. Probing pocket depth (PPD) and both groups had comparable initial results before and after treatment.

Results: *At each follow-up visit, biological and technical complications were assessed. There was a reduction in both PPD and BOP compared to baseline clinical measurements. Stable clinical scores of PPD and BOP were demonstrated after 6-month treatment*

initiation and remained stable over the next three years. The average BOP value in patients Group A before treatment for peri-implantitis was 2.5 ± 0.31. after 6 months, treatment month treatment 0.6 ± 0.24. The mean PPD in patients before treatment of peri-implantitis was 4.2 ± 0.24, after a 6-month treatment pocket was 3.1 ± 0.1(table 2). The average BOP value in patients Group B before treatment for peri-implantitis was 2.6 ± 0.42, after 6 months of treatment, 0.9 ± 0.29. The mean PPD in patients before treatment of peri- implantitis was 4.1 ± 0.45, after a 6-month treatment pocket was 3.8 ± 0.18. The mean BOP and PPD showed a statistically significant difference from baseline to 6 months (p≤0.05) in both Group A and Group B. however, mean BOP, PPD, the duction gain was found to be greater in Group-A than in Group B (p ≤ 0.05).

Conclusion: *Effective therapy for early peri-implantitis is systemic treatment of peri-implantitis with antibiotics, antiseptic treatment of peri-implant pockets and local application of "Armenicum" paste has shown its effectiveness and can prevent further development of peri-implantitis.*

Keywords
Combined therapy peri-implantitis, "Armenicum" paste.

Introduction
Currently, dental implants are the leading and predictable method of prosthetic treatment in patients with complete and partial edentulism, which improves chewing function and quality of life [1-3]. Despite the high effectiveness of implant treatment, various biological and prosthetic complications are recorded at various stages of the implantation process, that can occur from early failures to later stages [4-6]. According to various authors, in patients with implants, perimucositis and peri-implantitis is one of the most common late complications [7,8].

According to the European Federation of Periodontology, perimucositis is defined as an inflammatory lesion of the soft tissues surrounding the implant without involvement of the bone tissue [9]. Perimucositis manifested in the early stage by peri-implant mucosal lesions, which, if not treated in time, can develop into peri-implantitis. Peri-implantitis, is an inflammatory disease of the tissues surrounding osseointegrated dental implants with varying degrees of peri-implant bone loss, increased pocket formation, purulence and characterized by both inflammation and progressive bone loss. A consensus report identified the prevalence (5–10-year period) of peri-implantitis as 28% to 56% of patients and 12% to 40% of implants [10]. Peri-implantitis is caused by a variety of etiologies (Figure1) [11,12].

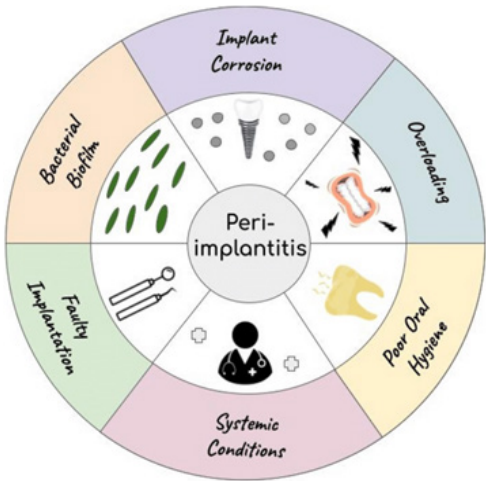

Figure 1: Etiologies of Peri-implantitis.

In most cases, plaque accumulation is the primary cause. It is believed that during implant placement, the oral microflora influences the formation of a biofilm on the implant surface. Scientific data confirm the important role of bacteria in inflammation of the tissues surrounding the implant. In the case of peri-implantitis, the most common microorganisms identified are: Include Staphylococcus epidermidis, Fusobacterium nucleatum, T. denticola, T. forsythia, P. intermedia, and P. gingivalis, but not Aggregatibacter actinomycetemcomitans, Staphylococcus aureus or Campylobacter rectus [13,14]. Pathogenic bacteria present in the periodontal pockets of natural teeth can migrate to the area of the placed implants, therefore the risk of peri-implantitis is particularly high in the case of periodontitis in the oral cavity.
Local Risk factors for peri-implantitis include; (Figure 2) [15-21].

- Poor oral hygiene
- Lack of regular supportive peri-implant care (SPIC).
- Lack of sufficient keratinized gingiva around the implants
- Retention of cement residues in the peri-implant gingival sulcus in case of cement fixation of prostheses to implants.
- Previous diagnosis of periodontitis,

Biomechanical factors include (Figure 2); [22-26].

- occlusal overload associated with irrational prosthetics,
- para-functional habits including bruxism

Smoking, systemic diseases, diabetes mellitus, osteoporosis, long-term treatment with corticosteroids and bisphosphonates, chemotherapy and diabetes are also important in the development of peri-implantitis (Figure 2) [27-30].

Perimucositis is manifested by the following clinical symptoms:

- hyperemia
- hyperplasia in peri-implantation mucosa.
- presence of calculus or stone in the cervical region of the implant.
- bleeding during probing.
- absence of bone resorption radiographically.

Peri-implantitis manifests as follows clinically with symptoms:

- swelling,
- hyperemia,
- hyperplasia in the peri-implant mucosa,
- presence of calculi or stones in the peri-implant area,

- bleeding during probing,
- increased probing depth,
- production of serous or pus from the gum pocket,
- destruction of peri-implant bone tissue,
- bone resorption radiographically.

Figure 2: Risk factors for peri-implantitis.

In the absence of appropriate treatment of peri-implantitis, ultimately leading to its disintegration and subsequent loss of the implant. There are various models for classifying peri-implantitis [31]. The most widely accepted is the Froum classification model (Froum and Rosen, 2012), where the assessment indicators include:

- bleeding on probing (BOP),
- peri-implant pocket depth (PD),
- degree of peri-implant bone loss (bone loss).

The classification of peri-implantitis into 3 categories according to Froum & Rosen (2012): [32]

- Early peri-implantitis - PD≥4 mm, BOP+, bone loss <25
- Moderate peri-implantitis - PD≥6 mm, BOP+, bone loss 25%-50%
- Advanced peri-implantitis - PD≥8 mm, BOP+, bone loss >50%

Treatment of peri-implantitis includes conservative or surgical methods (Figure 3).

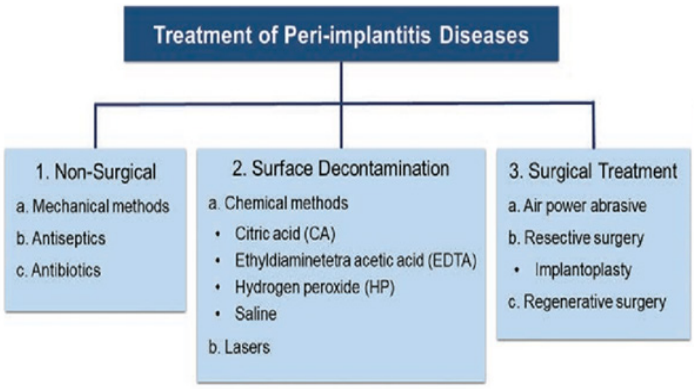

Figure 3: Treatment methods of peri-implantitis.

When developing a treatment strategy for peri-implantitis, the degree of peri-implantitis should be taken into account.

General clinical principles of peri-implantitis treatment;

- Elimination of infectious factors.
- Sanitation of the implant surface, removal of hard and soft deposits.
- Surgical or non-surgical methods of mechanical and chemical cleaning of the implant surface.
- Reduction of the depth of the gingival pockets in areas where they are not of aesthetic importance (resective method).
- Surgical interventions aimed at restoring lost tissues in the area of intraosseous defects (regenerative method).

Currently, there are various treatment protocols for peri-implantitis: conservative methods (chemotherapeutic disinfection, use of antibacterial agents, laser therapy) [33-39]. Conservative therapy for peri-implantitis includes mechanical debridement with plastic curettes, subgingival air-polishing devices, combined with antiseptic and/or antibiotic agents.

Recommended decontamination of the implant using a variety of mechanical and chemical methods (Citric Acid, Ethylenediaminetetraacetic Acid (EDTA), Hydrogen Peroxide (HP), Saline), 0.12% chlorhexidine, 3% hydrogen peroxide), local Atridox gel (doxycycline hyclate 10%), Elyzol gel (25% metronidazole), Periochip (chlorhexidine gluconate), then adjunctive systematic antibiotics, Simulated Radiation Emissio (lasers), and oral hygiene instruction [40-46].

Some authors have also successfully used laser therapy, ozone therapy and platelet-rich plasma in the therapy of peri-implantitis [47-52]. Surgical treatment includes a variety of methods (resection and regenerative) treatment by filling the intraosseous peri-implant defect with bone graft material and absorbable membranes [53-55]. During restorative treatment, after removal of pathological tissues and antiseptic dressing, the peri-implant ossification defect is repaired with bone graft material and absorbable membranes [56,57].

Resective surgery, which removes bony ledges and flattens the bone irregularities around the implant [58,59]. Implantoplasty, where the threads on the screw of the implant are removed to leave a polished implant surface. However, no standard treatment protocol has yet been proposed that could lead to improved outcomes. All methods are effective to varying degrees, but so far no universal standard treatment method has been proposed that would be completely effective, which requires a search for new treatment methods. The strategy for choosing treatment measures for peri-implantitis and their effectiveness continues to be a subject of discussion, which makes scientific work in this direction relevant. In the conservative treatment of peri-implantitis, it is advisable to include antibacterial, local immunostimulating drugs which have anti-inflammatory and antimicrobial properties. According to the data of our previous study, taking into account the effectiveness of

local application of Armenicum paste in the complex treatment of patients with periodontitis, we considered it appropriate to include it in this study [60].

Preparation “Armenicum” pharmaceutical composition contains iodine, alpha-dextrin in concentration with organic compounds. "Armenicum" paste has antibacterial and antiviral activity, acts as an antioxidant at the site of infection and inflammation. "Armenicum" paste enhances tissue regeneration, wound healing, stimulates fibroblast migration and cell proliferation [61-64].

The mechanisms of this action of "Armenicum" are based on enhancing the intracellular death of bacteria in the body in the phagolysosomes of neutrophils and monocytes, stimulating the release of several endogenous antimicrobial substances, including intermediate products of the active form of oxygen, nitric oxide and the so-called halides [65-67].

The aim of our study is to evaluate the effectiveness of Armenicum paste in the conservative treatment of early peri-implantitis.

Methods

Study Design

This is a blinded RCT clinical prospective study of 47 patients diagnosed with early peri-implantitis according to the classification of Froum & Rosen (2012) who were treated from 2023 to 2025.

Study Population

The patients’ age ranged from 32 to 64 years; 25 men and 22 women were included. The diagnosis of periimplantitis was confirmed taking into account, indicators of bleeding on probing (BOP) > 20%, probing depth (PD) ≥ 4mm, radiological signs of bone loss (MBL) ≥ 1m.

Assortment of Ptients

All patients selected for study were examined under the inclusion and exclusion criteria and sign the written consent.

Inclusion criteria

Patients diagnosed with early peri-implantitis, non-smokers, systemically healthy, had not received any previous peri-implantitis treatment (within the previous year) no any antibiotic therapy or chemotherapeutic mouth-rinse or oral irrigation (within the last 6 months), were included. Patients who can perform oral hygiene selfcare and commitment to post-treatment follow-up visits were chosen.

Exclusion criteria

Patients with systemic diseases, smokers, pregnant females, previous peri-implantitis treatment (during the previous year) or antibiotic intake (during the past 3 months), were excluded.

Randomization, Blinding and Treatment Allocation

Patients are assigned randomization to the 2 intervention groups known only to the principal investigator, who is not involved in the measurement. The study adheres to the CONSORT guidelines (Table 1).

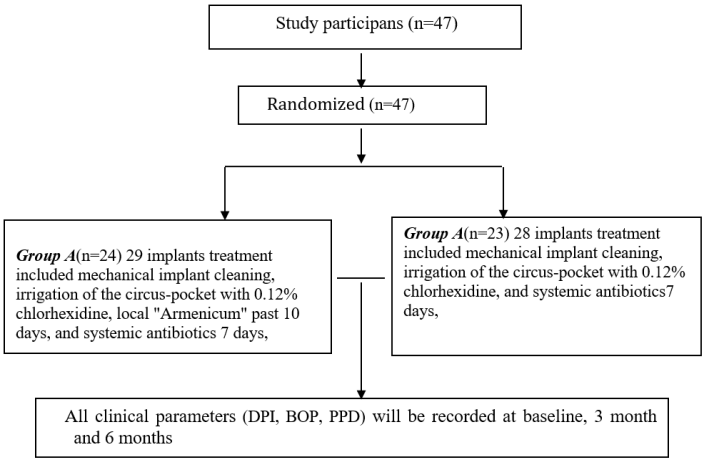

Table 1: CONSORT Study participants.

According to the selected treatment method, patients were randomly divided into two groups:
Group A (24 patients - 13 men and 11 women), 29 implants treatment included mechanical implant cleaning with titanium or plastic-curettes, Air-Flow Perio Soft, irrigation of the circus-pocket with 0.12% chlorhexidine, additional use of local "Armenicum" past 10 days, and systemic antibiotics (amoxicillin 500mg and metronidazole) all the above antibiotics were administered per with duration of 7 days.

"Armenicum" paste a commercially available product (manufacturing company ARMENIKUM, CJSC Armenia) in one syringe paste 25 g.

Group B (23 patients - 10 men and 13 women), 28 implants treatment included mechanical implant cleaning with titanium or plastic-curettes, Air-Flow Perio Soft, irrigation of the circus-pocket with 0.12% chlorhexidine, and systemic antibiotics (amoxicillin 500mg and metronidazole) all the above antibiotics were administered per with duration of 7 days. The patient was under dynamic control, and professional hygiene was carried out.

To assess the effectiveness of treatment, the following clinical parameters were assessed:
1. bleeding on probing (BOP);
2. probing pocket depth (PPD) and both groups had comparable initial results before and after treatment.

Statistical Analyzes

Performed using SPSS software for Windows, Version 29.0.0.0 (SPSS Inc, Chicago). The average values for the BOP, PPD, per implants were calculated. Significance level $P<0.05$ was used to determine the significant differences between implants A, B groups.

Results

At each follow-up visit, biological and technical complications were assessed. There was a reduction in both PPD and BOP compared to baseline clinical measurements. Stable clinical scores of PPD and BOP were demonstrated after 6-month treatment initiation and remained stable over the next three years.

The average BOP value in patients Group A before treatment for peri-implantitis was 2.5 ± 0.31 of 6 months, treatment month treatment 0.6 ± 0.24. The mean PPD in patients before treatment of peri-implantitis was 4.2 ± 0.24, after a 6-month treatment pocket was 3.1 ± 0.1. The average BOP value in patients Group B before treatment for peri-implantitis was 2.6 ± 0.42 of 6 months, treatment month treatment 0.9 ± 0.29. The mean PPD in patients before treatment of peri- implantitis was 4.1 ± 0.45, after a 6-month treatment pocket was 3.8 ± 0.18. The mean BOP, PPD showed a statistically significant difference from baseline to 6 months ($p \leq 0.05$) in both Group A and Group B however, mean BOP, PPD, duction gain was found to be greater in Group-A than Group B ($p \leq 0.05$) (Table 2).

Table 2: Average Mean Clinical Indices at Baseline and After 6 months BOP, PPD in Patients Group-A, B.

Clinical indices	*Baseline*	6 months	p-value
Group A (n=24) 29 implants			
BOP	2.5 ± 0.31	0.6 ± 0.24	<0.05
PPD	4.2 ± 0.24,	3.1 ± 0.1	<0.05
Group B (n=23), 28 implants			
BOP	2.6 ± 0.42,	0.9 ± 0.29.	<0.05
PPD	4.1 ± 0.45,	3.8 ± 0.18	<0.05

*significant difference $p<0.05$

Discussion

A number of protocols have been suggested for the treatment of peri-implantitis including various conservative (antibacterial pastes, emulsions) lasers for therapy and surgical treatments, but none of them is universal [68-70].

According to Schwartz et al., in the case of superficial peri-implant lesions, mechanical treatment and irrigation with an antiseptic solution (0.2% chlorhexidine solution) are recommended, leading to a statistically significant improvement in probing pocket bleeding around the implants [71]. Anca Silvia Dumitri et al. in their study documented the effectiveness of mechanical treatment and the use of chlorhexidine in reducing inflammation [72]. According to Yaniv Mayer et al., adjunctive treatment with local antiseptic and anti-inflammatory agents during the mechanical phase has a positive effect on reducing peri-implant inflammation [73]. Research results by André Büchter et al. have shown that the local use of Atridox gel (doxycycline hyclate 10%), in the treatment of peri-implantitis significantly improved clinical indices [74].

Research results E Stellani's have shown that metronidazole dental gel 25% topical antibiotic application is effective in the peri-implant treatment complex [75]. There are also works by many other authors who have presented various conservative treatment protocols for the treatment of periimplantitis [76-82]. Thus, for the prevention and treatment of peri-implantitis, it is necessary to take an integrated approach and use drugs that can have a professional inflammatory effect, enhance tissue regeneration and increase local immunity. Taking into account the results obtained by the above-mentioned authors, we have included Armenicum paste in the peri-implantitis treatment complex in our work, taking into account the antioxidant, antibacterial and regenerative properties of this preparation and its demonstrated effectiveness in the treatment of periodontitis. "Armenicum" belongs to the group of physiologically active polymers (FAP) of the "grafting type", since it predominantly exhibits the properties of such a physiologically active substance as iodine [83].

This study describes clinical results of a non-srgical treatment of peri-implantitis.The success of the treatment method used in this study was assessed by objective clinical indices such as PPD and BOP; Significant clinical stabilization, statistically significant reductions in indices were recorded in the group of patients where the treatment protocol included mechanical cleaning of the implants, irrigation of the periapical pocket with 0.12% chlorhexidine, local "Armenicum" paste and additional use of systemic antibiotics Hygienists play an important role in post-implant therapy, as they are the first responders. They must detect any signs of inflammation around the implant. But their role is primarily to educate patients that biofilm is a major risk factor for peri-implant disease. Long-term success of peri-implant treatment requires a maintenance program, including hygiene instructions. The limitation of this study is due to the number of implants and the lack of long-term clinical follow-up, which dictates that further work should be conducted with a larger number of patients and longer-term observation of treatment outcomes.

Conclusion

Conservative treatment with systemic antibiotics, pocket elimination and local use of "Armenicum" paste was an effective therapy in early periimplantitis.

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