A Modern Approach To The Treatment And Diagnosis Of Generalized Periodontitis

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***Abstract*—Generalized periodontitis is characterized by progressive destruction of soft and hard tissues. The main goal of treatment is to reduce the amount or eliminate subgingival pathological microflora, restore destroyed structures and stabilize the achieved result. Due to the fact that the disease has an unfavorable prognosis, surgical treatment is considered effective. Current treatment regimens should include the need for timely diagnosis and the expediency of combining various methods, only in this case can a long-term stabilization of the periodontal condition be assumed.**

Keywords: periodontitis, surgical treatment, diagnosis, periodontal disease.

INTRODUCTION

Currently, a substantial number of patients with periodontal diseases seek care in dental outpatient clinics. Particular attention is given to patients diagnosed with generalized periodontitis, in whom pathological processes are frequently accompanied by tooth mobility, pronounced inflammation, secondary occlusal deformities, and aesthetic and speech impairments.

According to scientific studies conducted at the Department of Periodontology, Wonkwang University School of Dentistry (Republic of Korea), the prevalence of generalized periodontitis in a study population of 1,692 patients was 28 cases (1.65%). No significant gender differences were identified. The generalized form occurred more frequently than the localized form at a ratio of 27:1. The mean age of affected individuals was 34.5 years.

Difficulties in timely diagnosis and management contribute to destructive changes within the periodontal tissue complex, characterized by reduction of the alveolar bone, decreased supporting function of the periodontium, dental arch deformities, and eventually partial or complete tooth loss. Furthermore, a chronic periodontal infectious focus may contribute to the development of purulent-inflammatory conditions of the maxillofacial region, posing significant risks to patients' health and life. Delayed diagnosis most often reduces the likelihood of successful treatment [1].

However, both the quantity and quality of scientific research in this field are rapidly increasing. The most promising therapeutic approaches currently include tissue engineering and genetic technologies.

Improvement of preoperative assessment and patient preparation for surgical intervention is of critical importance. In clinical practice, treatment planning is often based solely on medical history data regarding the presence or absence of systemic pathology, which may result in suboptimal therapeutic decisions. Under such conditions, postoperative reparative processes frequently occur in the setting of impaired microcirculation and tissue hypoxia, leading to significantly reduced osteoplastic activity and negatively affecting surgical outcomes. Therefore, therapeutic measures should target not only the affected jaw regions but also concomitant systemic disorders.

The aforementioned considerations highlight the necessity of implementing novel, highly effective comprehensive treatment strategies aimed at restoring the anatomical and functional integrity of the dentoalveolar system and eliminating associated systemic disturbances in patients with generalized periodontitis.

Objective: To analyze the scientific literature devoted to periodontal diseases and contemporary treatment modalities.

MATERIALS AND METHODS

A literature review of articles published in scientific medical journals indexed in eLibrary, the Russian Science Citation Index (RSCI), the Higher Attestation Commission of Uzbekistan, and PubMed.

RESULTS AND DISCUSSION

Before Generalized periodontitis develops as a result of the interaction of multiple factors, including microbial invasion, genetic predisposition, immunological status, and environmental influences, which determine the onset, course, and severity of the disease. The presence of harmful habits such as smoking, as well as inadequate oral hygiene, leads to more pronounced destruction of the periodontal complex compared to individuals who adhere to proper oral hygiene practices.

The disease is characterized by a wave-like course with alternating phases of exacerbation and remission, resulting in two distinct clinical presentations.

During remission, patients typically report no complaints. The gingiva appears pale pink; however, periodontal probing reveals deep periodontal pockets. The absence of overt inflammatory signs despite the presence of deep periodontal pockets and compromised dentogingival attachment, combined with

relatively preserved systemic health, is characteristic of generalized periodontitis in the remission phase.

Remission periods may last from several weeks to months or even years and alternate with exacerbations.

During exacerbation, progressive destruction of the alveolar process and loss of periodontal attachment occur. Clinically, the gingiva demonstrates signs of inflammation ranging from mild to severe. Inflammatory gingival hypertrophy is frequently observed. Periodontal probing with a calibrated probe typically results in bleeding in six sites per tooth, and spontaneous purulent exudation may occur. Many patients seek dental care at this stage of the disease.

The prognosis of treatment largely depends on timely diagnosis. Early detection prevents disease progression and significant alveolar bone loss. Additionally, the tendency toward genetic predisposition necessitates preventive examination of close relatives.

Conservative therapy remains the cornerstone of treatment for generalized periodontitis. In early stages, when periodontal and osseous destruction is mild to moderate, management includes systemic antibiotic therapy combined with mechanical debridement. Treatment should aim at bactericidal or bacteriostatic effects on etiological factors and correction of modifiable risk factors.

An individual host immune response to pathogenic dental plaque bacteria plays a crucial role in pathogenesis and progression. This response is genetically determined and represents a non-modifiable risk factor. Nevertheless, because the disease is partially dependent on microbial and behavioral factors, it can be effectively controlled in susceptible individuals, underscoring the absolute importance of timely plaque removal. Even minimal plaque accumulation may trigger both humoral and cellular immune responses in predisposed patients [2].

Systemic Antibacterial Therapy

Systemic antibiotic therapy constitutes an important component of generalized periodontitis management, as certain pathogenic microorganisms—such as Aggregatibacter actinomycetemcomitans and Porphyromonas gingivalis—cannot be completely eradicated by other methods.

Historically, tetracycline antibiotics were widely used due to their ability to accumulate in periodontal tissues and inhibit the growth of A. actinomycetemcomitans. Additionally, tetracyclines suppress collagenase activity, thereby reducing tissue destruction and promoting bone regeneration. However, the emergence of antibiotic resistance necessitated the use of alternative regimens, and combined or sequential antibiotic therapies demonstrated improved effectiveness.

Currently, a combination of amoxicillin and metronidazole administered for eight days is recommended as one of the most effective and accessible therapeutic options. Species identification and antibiotic susceptibility testing are not always mandatory, as the aforementioned drug combinations offer clinical and economic advantages. Antibiotic selection should be based on multiple criteria, including possible individual reactions, comorbidities, and medical history data [3].

Local Antimicrobial Therapy

Local antimicrobial therapy is as essential as systemic therapy in the management of generalized periodontitis, particularly in cases of localized accumulation of exudate within deep periodontal pockets and insufficient response to mechanical therapy and systemic antibiotics.

The primary advantage of this approach is the delivery of lower drug doses directly into the periodontal pocket while maintaining high concentrations of the active agent at the site of microbial invasion. This strategy minimizes systemic adverse effects typically associated with systemic antibacterial therapy [4].

Scaling and Root Planing (SRP)

Scaling and Root Planing (SRP) is an instrumental procedure involving mechanical debridement of coronal and root surfaces aimed at the removal of supra- and subgingival dental calculus, as well as root surface planing. It is widely used by dental practitioners as an etiological treatment for periodontitis.

Hand instruments such as curettes and scalers, as well as air-abrasive systems, may be employed for this purpose. SRP is typically performed in a single visit and is considered a standard procedure in most clinical cases, contributing to a reduction in bacterial load. Following treatment, coronal and root surfaces should be hard, clean, and free of micro-roughness.

However, SRP does not guarantee complete elimination of pathogenic microflora and their metabolic by-products from periodontal pockets, which explains its limited efficacy in the presence of deep periodontal pockets.

Quirynen proposed an alternative antimicrobial protocol based on full-mouth disinfection performed in a single phase. This method has demonstrated superior clinical improvement in early stages of periodontitis compared to isolated SRP. The protocol includes:

- tongue decontamination with 1% chlorhexidine for 1 minute,
- removal of dental calculus,
- mouth rinsing with 0.2% chlorhexidine for 2 minutes,

– irrigation of periodontal pockets with 1% chlorhexidine.

Precautions must be observed, as high concentrations of chlorhexidine may induce contact dermatitis, pruritus, or urticaria in allergic patients. The safety of topical chlorhexidine use during pregnancy and lactation has not been sufficiently studied; therefore, it should be prescribed only when clearly indicated.

In general, treatment modality selection should be individualized according to the specific clinical presentation and patient preferences [5].

Photodynamic Therapy and Laser Irradiation

Photodynamic therapy (PDT) and laser irradiation are used as adjunctive modalities that suppress pathogenic microorganisms within periodontal pockets.

Laser therapy—particularly gas helium-neon lasers and semiconductor gallium-arsenide lasers—has proven to be an effective and minimally traumatic method due to its bactericidal and detoxifying effects. These effects are associated with:

– improvement of local microcirculation,

– enhanced leukocyte migration from the vascular bed,

– activation of proteolytic enzymes detrimental to microbial pathogens.

The emitted light waves demonstrate significant tissue penetration into inflamed periodontal sites [6].

Photodynamic therapy (PDT) provides a non-invasive antimicrobial effect through the generation of singlet oxygen and free radicals, which effectively eliminate pathogenic microflora. PDT demonstrates high clinical efficacy and offers several advantages:

– reduced treatment time of subgingival areas,

– rapid microbial destruction,

– no requirement for local anesthesia,

– absence of damage to healthy tissues,

– no development of bacterial resistance.

Currently, these modalities represent promising directions in non-invasive therapy for generalized periodontitis. The combined use of SRP, PDT, and laser irradiation yields significantly better clinical outcomes compared to their isolated application. Regular follow-up visits during the initial treatment phase allow evaluation of therapeutic effectiveness [7].

Non-Surgical Treatment Strategy

A review of educational and scientific publications on non-surgical management of generalized periodontitis indicates that this disease may be successfully controlled through therapeutic interventions. Such treatment prevents progression of the pathological process, reduces inflammation, decreases periodontal pocket depth, and promotes substantial repair of alveolar defects.

Therapeutic measures should begin with primary or adjunctive mechanical antimicrobial therapy combined with systemic antibiotics. Antibacterial therapy is recommended to be initiated 24–48 hours prior to SRP or other mechanical debridement procedures and continued as a course regimen.

Re-evaluation is performed 4–6 weeks after treatment. If significant clinical improvement is not observed in the early stages, the clinician may modify therapy by combining different antibiotic regimens and conservative treatment methods. In the absence of satisfactory response, surgical intervention is indicated [8].

Surgical Treatment

Surgical management of generalized periodontitis comprises a set of measures aimed at preventing further destruction and alveolar bone loss in cases of delayed diagnosis or ineffective conservative therapy.

To minimize microtrauma and adverse effects, the use of laser technologies is justified. However, in cases of severe periodontal tissue destruction, surgical treatment may increase tooth mobility and potentially worsen the clinical condition. Therefore, thorough individual risk–benefit assessment is essential [9].

Modern reparative periodontal surgery focuses on restoring anatomical integrity and functional capacity of periodontal structures. Wide application of autografts, xenografts, and synthetic grafting materials is recommended. Biological modifiers such as insulin-like growth factor (IGF), A-PRF (Advanced Platelet-Rich Fibrin), I-PRF (Injectable Platelet-Rich Fibrin), and extracellular matrix proteins are also utilized.

Flap surgery is indicated for elimination of periodontal pockets. Repositioned flaps and papilla preservation flaps are considered procedures of choice. Combination of surgical therapy with antibacterial agents significantly reduces microbial load and pocket depth.

Guided Tissue Regeneration and Bone Grafting

Rapidly progressing bone destruction requires urgent clinical decision-making. Effective treatment modalities with favorable prognosis include:

– Guided Tissue Regeneration (GTR),

– Bone grafting procedures.

The dental materials market provides a wide range of grafting materials, including autografts, allografts, xenografts, and alloplastic substitutes.

Autografts—transplanted within the same individual—are considered the gold standard due to their strong regenerative potential confirmed by histological evidence. Advantages include absence of disease transmission and immunologic reaction, as

well as cost-effectiveness. Limitations include limited graft volume and potential donor-site morbidity.

Advances in tissue engineering and biomaterial technologies have expanded clinical options, encouraging the use of allografts, xenografts, and synthetic substitutes.

Allografts involve transplantation between genetically different individuals of the same species. Cellular components are removed to reduce rejection risk, and materials undergo special processing to eliminate disease transmission. Clinical studies demonstrate successful outcomes, with over 50% resolution of intrabony defects.

Xenografts are derived from bovine, porcine, or coral sources. Combination of bovine-derived material with purified porcine collagen or synthetic polypeptides (e.g., PepGen P-15) stimulates regenerative processes and promotes formation of secondary periodontal ligament. Collagen exhibits high biocompatibility due to low allergenicity and biodegradability, reduces inflammation, and accelerates wound healing.

Synthetic substitutes include osteoconductive polymers in the form of blocks, granules, cements, or osteoinductive proteins that stimulate osteogenesis, cementogenesis, and periodontal ligament formation. Osteoconductive materials serve as passive scaffolds for newly formed bone. Hydroxyapatite, beta-tricalcium phosphate, and bioactive glass are widely used alloplastic materials [10].

Guided Tissue Regeneration (GTR)

The principle of GTR is based on the use of barrier membranes that prevent gingival epithelial migration and granulation tissue formation, thereby creating favorable conditions for regeneration of connective tissue attachment by periodontal progenitor cells.

Membranes may be derived from biological materials or prepared from centrifuged autologous blood. Expanded polytetrafluoroethylene (ePTFE) membranes are frequently used.

Numerous experimental and clinical studies confirm the effectiveness of membrane techniques combined with grafting materials. Ongoing refinement of this method has demonstrated predictable success in the treatment of three-wall intrabony defects.

Biological Modifiers

Use of biological modifiers—including insulin-like growth factor, platelet-derived growth factor, platelet-rich plasma (PRP), and extracellular matrix proteins—results in positive clinical and radiographic outcomes.

Platelet-rich plasma facilitates periodontal tissue regeneration, as platelets play a central role in wound healing. They initiate coagulation at the injury site and release growth factors that accelerate regeneration. Platelets also contain fibrinogen, fibronectin, and vitronectin, which function as scaffolding proteins supporting osteoconduction and connective tissue repair.

Pronounced osteoinductive and osteoconductive properties of these materials contribute to restoration of both quality and quantity of lost bone tissue [11].

Comprehensive and Interdisciplinary Approach

Treatment of generalized periodontitis is complex and requires an interdisciplinary approach. When diagnosed at an advanced stage, tooth loss risk may reach up to 60%.

Tooth loss at a young age negatively affects psychological well-being and may lead to behavioral changes. In such cases, aesthetic rehabilitation can be achieved through combined periodontal and orthodontic therapy, prosthodontic rehabilitation, and implant treatment.

Long-term supportive periodontal therapy is mandatory to maintain treatment outcomes and prevent recurrence. Psychotherapy may also provide beneficial effects and should be initiated after the initial dental consultation, with duration depending on the patient's psychological status [12].

Modality	Main mechanism	Clinical application	Evidence level
Photodynamic therapy (aPDT)	ROS-mediated bacterial destruction	Adjunct to SRP in deep pockets	Moderate–High (systematic reviews)
Laser-assisted periodontal therapy	Antimicrobial + biostimulation	Adjunctive decontamination, healing support	Moderate
Systemic antibiotics (Amoxicillin + Metronidazole)	Suppression of anaerobic pathogens	Severe/aggressive forms with deep pockets	High (meta-analyses)
Local antimicrobials (CHX, minocycline)	High local drug concentration	Residual pockets after SRP	Moderate
Guided tissue regeneration (GTR)	Barrier membranes + selective cell repopulation	Intrabony defects	High
Bone grafting (xeno/alloplast)	Osteoconductive scaffold	Regeneration of defects	High
Platelet concentrates (PRF/i-PRF)	Growth factor release	Soft tissue healing, regeneration adjunct	Emerging–Moderate
Host modulation therapy	Downregulation of destructive inflammation	Selected high-risk patients	Limited–Moderate

I. Conclusion

After Generalized periodontitis is characterized by progressive destruction of both soft and hard periodontal tissues. The primary objectives of treatment are:

• reduction or elimination of subgingival pathogenic microflora,

• regeneration of destroyed structures,

• stabilization of achieved clinical outcomes.

Given the unfavorable prognosis of advanced disease, surgical management is often considered the most effective approach. Contemporary treatment protocols must emphasize early diagnosis and rational combination of therapeutic modalities to achieve long-term periodontal stability.

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