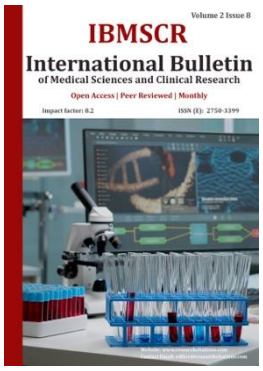

"IMPROVING COMPREHENSIVE TREATMENT MEASURES FOR THE PREVENTION OF PERI-IMPLANTITIS IN PATIENTS WITH DENTAL IMPLANTS."

Karimqulov Nodirbek Abdujalilovich
PhD, Andijan State Medical Institute
Teshaboyev Nurmuhammad To'lanboy o'g'li
1st-year Master's student in Dentistry, Andijan State Medical Institute
Jahongirov Boburbek Ikromjon o'g'li
1st-year Master's student in Dentistry, Andijan State Medical Institute
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Abstract

This article discusses modern approaches to the prevention of periimplantitis in patients with dental implants through comprehensive therapeutic and preventive measures. Based on recent scientific literature, the etiological factors, microbial biofilm formation, inflammatory reactions of peri-implant tissues, and risk factors associated with peri-implantitis are analyzed. Special attention is given to the role of professional oral hygiene, antibacterial therapy, bioactive materials, and modern implant surface technologies such as SLA, Xpeed, and X- ctive in improving implant survival and peri-implant tissue health. The effectiveness of combined treatment strategies aimed at reducing inflammation, enhancing osseointegration, and preventing bone loss around implants is also highlighted.

Keywords: dental implants, periimplantitis, orthopedic dentistry, osseointegration, biofilm, peri-implant tissues, prevention, SLA surface, Xpeed technology, Хи Active implants, bioactive materials, oral hygiene.

Introduction

Dental implantation has become one of the most reliable and widely used methods for the rehabilitation of partially or completely edentulous patients in modern orthopedic dentistry. High functional and aesthetic outcomes have significantly increased the popularity of implant-supported restorations. However, despite the success of implantology, biological complications such as peri-implant mucositis and peri-implantitis remain major clinical challenges.

Periimplantitis is a chronic inflammatory disease affecting the soft and hard tissues surrounding dental implants, leading to progressive bone loss and, ultimately, implant failure if untreated. The development of peri-implantitis is associated with bacterial plaque accumulation, inadequate oral hygiene, systemic diseases, smoking, occlusal overload, and insufficient maintenance care. Therefore, the prevention of peri-implant inflammation has become an important aspect of long-term implant success.

Recent advancements in implant dentistry have introduced innovative implant surface technologies designed to improve osseointegration and reduce inflammatory complications. Among these, SLA (Sandblasted, Large-grit, Acid-etched) surfaces are widely recognized for enhancing bone-to-implant contact and accelerating healing processes. In addition, Xpeed technology, based on calcium ion surface modification, improves the biological activity of implant surfaces and supports faster osseointegration. X-Active implant systems also demonstrate improved stability and tissue compatibility, contributing to the prevention of peri-implant tissue inflammation.

Modern preventive and therapeutic approaches include professional oral hygiene, antimicrobial therapy, laser-assisted decontamination, guided bone regeneration, and individualized maintenance protocols. Comprehensive treatment strategies combining mechanical, pharmacological, and biological methods are considered the most effective for minimizing peri-implant complications and ensuring long-term implant stability.

Understanding the interaction between implant materials, surface technologies, peri-implant tissues, and microbial factors is essential for improving clinical outcomes in implant dentistry. This article reviews modern literature concerning the improvement of comprehensive preventive and therapeutic measures against peri-implantitis in patients treated with dental implants.

Materials and Methods

This study is based on a comprehensive review of scientific literature published between 2019 and 2025, focusing on the prevention and management of peri-implantitis in implant-supported prosthetic treatment. The analyzed studies included clinical trials, systematic reviews, and experimental investigations related to peri-implant tissue response, microbial control, implant surface modifications, and comprehensive treatment approaches.

The review evaluated traditional mechanical debridement methods, antiseptic and antibiotic therapies, laser-assisted procedures, probiotic approaches, and the application of bioactive materials for peri-implant tissue regeneration. Special emphasis was placed on studies investigating modern implant surface technologies, including SLA, Xpeed, and X-Active systems, and their effectiveness in enhancing osseointegration, reducing bacterial colonization, and minimizing peri-implant bone loss and inflammatory complications.

Results and Discussion

The reviewed studies demonstrated that peri-implantitis remains one of the most significant biological complications associated with dental implantation. The incidence of inflammatory changes around implants was strongly associated with poor oral hygiene, bacterial biofilm accumulation, smoking, uncontrolled systemic diseases, and inadequate supportive periodontal therapy. Clinical findings showed that early preventive measures significantly reduced peri-implant tissue inflammation and improved long-term implant survival.

Studies evaluating modern implant surface technologies revealed that SLA surfaces promote faster and stronger osseointegration due to their micro-roughened structure, which enhances osteoblast attachment and bone formation. Improved bone-to-implant contact contributes to greater implant stability and decreases the risk of peri-implant bone resorption during the healing period.

Research on Xpeed technology demonstrated that calcium ion modification of implant surfaces increases biological activity and accelerates the healing process. The hydrophilic and bioactive characteristics of Xpeed implants support early cell adhesion, angiogenesis, and mineralization, thereby reducing inflammatory reactions in peri-implant tissues. Clinical observations indicated lower marginal bone loss and improved soft tissue adaptation around implants treated with Xpeed technology.

X-Active implant systems also showed favorable clinical outcomes in patients with increased risk factors for peri-implantitis. Their enhanced surface properties contributed to improved primary stability and better tissue compatibility, especially in cases requiring immediate or early loading protocols. Reduced bacterial adhesion and improved soft tissue

sealing around the implant collar were considered important factors in preventing peri-implant inflammation.

Comprehensive preventive protocols combining professional oral hygiene, regular maintenance visits, mechanical debridement, antiseptic agents, and patient education demonstrated the highest effectiveness in controlling peri-implant diseases. Laser-assisted decontamination and antimicrobial therapy were shown to reduce pathogenic microorganisms and improve healing of peri-implant tissues when used as adjunctive treatment methods.

The analysis of current literature confirms that successful prevention of peri-implantitis depends not only on surgical technique and implant quality but also on long-term maintenance care and the application of modern bioactive implant technologies. The integration of SLA, Xpeed, and X-Active surface modifications into implant treatment protocols may significantly improve osseointegration, minimize inflammatory complications, and enhance the long-term prognosis of implant-supported restorations.

Conclusion

Peri-implantitis remains one of the major complications affecting the long-term success of dental implants in modern orthopedic dentistry. The progression of inflammatory processes around implants is closely related to microbial biofilm accumulation, insufficient oral hygiene, systemic risk factors, and inadequate maintenance therapy. Early diagnosis and preventive care play a crucial role in preserving peri-implant tissue health and preventing implant failure.

The analysis of recent scientific literature demonstrates that comprehensive preventive and therapeutic approaches provide the most effective results in reducing peri-implant inflammation and maintaining implant stability. Professional oral hygiene procedures, regular follow-up examinations, antibacterial therapy, laser-assisted decontamination, and patient education significantly contribute to successful peri-implant disease prevention.

Modern implant surface technologies such as SLA, Xpeed, and X-Active have shown promising biological and clinical advantages. These surface modifications improve osseointegration, enhance bone-to-implant contact, promote soft tissue adaptation, and reduce the risk of peri-implant bone loss. Bioactive and hydrophilic implant surfaces also accelerate healing processes and improve the long-term prognosis of implant-supported restorations.

Therefore, the integration of advanced implant technologies with individualized комплексное preventive protocols may significantly improve treatment outcomes and minimize biological complications in patients undergoing dental implantation. Further clinical and experimental studies are necessary to optimize preventive strategies and enhance the long-term success of implant therapy.

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