DOI: https://doi.org/10.33295/1992-576X-2025-1-48

UDC 616.314-089.23:616.716:616.31-022.252

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Advantages of Prosthetics for Edentulous Jaws Using Implant-Supported Bar Systems

▷ **Abstract.** One of the pressing issues in modern dentistry is the restoration of functional and aesthetic parameters of the dentoalveolar system in cases of complete and partial tooth loss, especially when a significant number of teeth are missing, making it impossible to restore the dental arch with fixed structures or removable partial dentures. In these cases, removable prosthetics become necessary. The study results indicated that removable prostheses fixed on implants are more prognostically favorable for preserving periodontal tissues than conventional full removable plate dentures.

Keywords: *plate dentures, resilient mucosa, implant-supported prostheses, bar system.*

Despite advancements in modern dental technologies, tooth loss remains a problem that creates a significant demand for removable prosthetics among adults. Generalized forms of periodontal pathology result in large defects in the dental arches, and pronounced atrophy of the alveolar processes complicates orthopedic treatment. Prosthetics become particularly challenging with severe bone tissue atrophy in the prosthetic bed of edentulous jaws. The most common method for treating complete edentulism remains the fabrication of full removable plate dentures with "traditional" fixation systems. However, this method often does not fully satisfy patients. Naturally, most patients are dissatisfied with this treatment method, as it does not improve their "quality of life."

Every year, the number of patients seeking high-quality fixation of removable prostheses in orthopedic dental clinics increases. This significantly impacts the quality of life and social adaptation of individuals. A healthy lifestyle and appearance play an important role in the modern world. Tooth loss leads not only to functional and aesthetic changes but also affects the psychological status of a person. Ineffective dental prostheses can further deteriorate psychological status and self-esteem.

This problem is critical in mandibular prosthetics, where the prosthetic bed is small and surrounded by strong mobile tissues, causing significant prosthesis movement during speech and chewing. Prosthetics for edentulous jaws using implants are a higher-quality method, as dental implants serve as immovable support elements, unlike the mucous membrane, which varies in resilience depending on individual characteristics.

This factor causes many complications in the treatment of complete edentulism with removable prostheses supported by dental implants, as there is still minor movement of the implant-fixed prosthesis. The use of dental implants for fixing removable dentures increases chewing efficiency by 35% compared to traditional removable prosthetics and almost fully restores the motor and tonic activity of the masticatory muscles. Functional activity of masticatory muscles is higher in patients using implant-supported removable prostheses than traditional plate dentures. Physiological adaptation of masticatory muscles to implant-supported prostheses accelerates twofold, and chewing efficiency is restored to 72.8%. Implant-supported removable prosthetics do not always provide 100% quality results; this method also has disadvantages. Movement of the prosthesis due to the resilience of the mucous membrane negatively affects prosthesis fixation and can lead to undesirable consequences.

In the complete absence of teeth, bone tissue atrophy continues in the distal parts of the mandible during prosthesis function, increasing the movement amplitude of the removable prosthesis and the impact of the fixing element on the dental implant. A comparative study of distal mandibular atrophy over three years showed that full removable dentures resulted in 1.3 mm atrophy, while implant-supported conditionally removable dentures resulted in 0.7 mm. Using implant-supported bar structures distributes the load effectively. The main advantage of bar-supported implant prostheses is the reliable fixation on the metal base, pro-

tecting implants from loosening and overload in the lateral and anterior sections during chewing, thus eliminating the disadvantages of removable dentures and significantly reducing the risk of complications.

In significant defects and multiple missing teeth, restoration is achieved not by individual implants but by a complete orthopedic structure. Any prostheses can be fabricated on implants installed in the jaw, including permanent crowns or removable constructions. The latter can be installed even with a completely absent dental arch. Special attachment systems are used to ensure reliable fixation of removable prostheses in the oral cavity, one of which is the bar structure.

Bar-supported prosthetics are a modern method of tooth restoration with undeniable advantages compared to traditional dentures. Chewing function is restored by no more than 40% with conventional dentures, often leading to increased pathological mobility of abutment teeth and subsequent loss. Bar-supported prosthetics allow for greater restoration of chewing function. Such prostheses provide reliable fixation and better aesthetics.

Implant installation does not guarantee complete bone preservation. The belief that bone resorption stops after implant placement is incorrect. Bone transitions to another phase of activity, receiving load from chewing through implants, whereas the chewing load is normally transmitted through the periodontal ligament. Bar fixation offers many advantages, making this method a leader among others. It allows for the restoration of the entire dental arch, eliminates discomfort due to smaller prostheses than classic ones, and distributes the chewing load, reducing pressure on the resilient mucosa. It ensures the stability of the removable plate prosthesis.

Let us consider a specific example. Seven patients (two men and five women) with complete secondary edentulism using full removable dentures for at least three years visited our clinic with complaints about poor prosthesis fixation during meals and speech and the constant need for adhesive agents.

These issues brought them to the clinic for re-prosthetics.

External examination revealed reduced lower facial height and pronounced nasolabial folds in all patients.

After a thorough examination (CT scans of the jaws), a decision was made to fabricate removable prostheses with bar fixation on implants.

All patients received four implants per edentulous jaw. Subsequently, bar structures with screw fixation were fabricated on these implants. After the examination and implant placement (four implants on the lower jaw and four on the upper jaw), plate dentures were fabricated and securely fixed on the jaws. No negative signs were observed after two years of prosthesis use by five patients and nearly three years by two others.

According to the patients, they returned to normal life. The prostheses remained stable during conversation and eating, taste sensations were restored due to the shortened palate on the upper jaw, and the need for adhesive agents was eliminated.

The main advantages of implant-supported removable prostheses with bar structures:

• The bar system provides additional rigidity to the prosthesis base. Load distribution reduces excessive pressure, prevents chafing, and protects the alveolar ridge from destruction.

• The atrophy process slows down and sometimes stops completely for several years, maintaining facial contours, biting, and preventing temporomandibular joint overload.

• Implant-supported prostheses are less prone to breakage since they do not need to be removed daily for cleaning. Hygiene is maintained with a brush and toothpaste, as with natural teeth. The metal base makes them less susceptible to breakage, whereas 10% of plate dentures break within the first year of use.

• Bar-supported prostheses are smaller, do not require additional fixation means, and need less frequent adjustments.

• Standard bar-based prostheses are easily repairable, saving time and money on fabricating new prostheses.

• Unlike other types of prostheses, bar-supported implant prostheses can be adjusted, crowns can be added or removed, and removable components (screws, abutments) can be replaced without harming the oral cavity or altering other structures.

Conclusion

All the above demonstrates the undeniable preference for fabricating implant-supported prostheses with bar structures.

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Переваги протезування беззубих щелеп за допомогою стрижневих систем на імплантатах

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Анотація. Однією з актуальних проблем сучасної стоматології є відновлення функціональних та естетичних параметрів зубощелепної системи при повній і частковій втраті зубів, особливо при відсутності значної кількості зубів, що унеможливлює відновлення зубної дуги за допомогою незнімних конструкцій або знімних часткових протезів. У цих випадках необхідне знімне протезування. Результати дослідження показали, що знімні протези, фіксовані на імплантатах, є прогностично більш сприятливими для збереження тканин пародонту порівняно зі звичайними повними пластинковими знімними протезами.

Ключові слова: пластинчасті протези, еластична слизова оболонка, протези на імплантатах, стержнева система.

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Стаття: надійшла до редакції 22.01.2025 р.; прийнята до друку 12.02.2025 р.