

Methods Of Fixation Of Removable Dentures Using Dental Implants

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Abstract

This paper presents a review of modern methods for fixing complete removable dentures using dental implants. The main types of implant-retained systems are discussed, including ball attachments, bar constructions, telescopic and magnetic retainers, along with their clinical indications and functional features. It is shown that the use of dental implants significantly improves the stability of prostheses, ensures even load distribution, reduces alveolar ridge resorption, and enhances patients' quality of life. Special attention is paid to the role of digital technologies (CAD/CAM design, 3D planning, milled suprastructures) in achieving precision and individualization of prosthetic constructions. Promising directions for further development include the use of mini-implants, nanostructured coatings, and biocompatible materials to increase the longevity and predictability of fixation systems.

Keywords: removable dentures, dental implants, prosthetic fixation, ball attachments, bar systems, telescopic crowns, CAD/CAM technologies, implant dentistry.

Modern prosthetic dentistry is increasingly focused on improving the functional efficiency and comfort of removable dentures. One of the most significant achievements of recent decades is the introduction of implant-supported designs, which provide reliable fixation and restore physiological chewing parameters. The use of implants as supporting elements for removable dentures has overcome the limitations of traditional retention methods based solely on anatomical and physical factors.

Various implant-retained fixation systems are used in clinical practice, including ball attachments, bar-retained systems, telescopic connections, and magnetic retainers. Each of these methods has distinct biomechanical features and specific clinical indications.

Ball attachments are the most common and simplest form of fixation, offering high stability and easy maintenance. Placement of two implants in the canine region of the mandible greatly enhances denture stability compared to conventional methods. **Bar-retained systems** are preferred in cases of advanced alveolar ridge atrophy, as they provide uniform load distribution and long-term durability.

Telescopic fixation systems, consisting of inner and outer crowns, ensure an optimal combination of retention and physiological load transfer. Their use reduces localized pressure points and helps preserve supporting bone. **Magnetic attachments**, though offering lower retention force, are advantageous in elderly patients or those with limited manual dexterity due to their convenience in insertion and removal.

Clinical studies demonstrate that implant-retained dentures significantly increase patient satisfaction, reduce discomfort, and improve speech function. They also contribute to decreased bone resorption and stabilization of occlusal relationships. According to international meta-analyses (Misch, 2021; Feine et al., 2020), two-implant-supported mandibular overdentures are now considered the "gold standard" for complete edentulism rehabilitation.

Digital **CAD/CAM technologies** have revolutionized the design and fabrication process of implant-retained prostheses. Virtual planning of implant positioning, the use of surgical navigation templates, and the milling of titanium or zirconia suprastructures ensure high accuracy of fit, improved passive adaptation, and predictable clinical outcomes. This digital precision is particularly critical for bar and telescopic systems, where structural accuracy directly affects prosthetic success.

A promising direction is the use of **mini-implants** for retaining lightweight prostheses in cases of severe bone atrophy, as well as the application of **nanostuctured titanium coatings** that promote rapid osseointegration. Biomechanical load analysis (Finite Element Analysis, FEA) enables prediction of long-term stability and individual optimization of implant configurations. Thus, fixation of removable dentures with dental implants represents a modern, clinically validated approach that integrates the achievements of surgical implantology, digital technologies, and biomechanical design. The choice of fixation system should be determined by individual anatomical, functional, and aesthetic factors, ensuring long-term clinical success and improved patient quality of life.