SUCCESS RATES OF IMPLANTATION IN PATIENTS WITH BONE DEFICIENCY

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Abstract
This thesis examines the factors affecting the success of dental implantation in patients with bone deficiency. Atrophy or resorption of the alveolar bone reduces primary implant stability and slows osteointegration. In modern clinical practice, bone augmentation, sinus lift, PRF (Platelet-Rich Fibrin), and bioactive materials are effectively used to address this issue. Studies show that using such regenerative methods can increase the success rate of implantation to 90–95%.

Keywords: bone deficiency; implant success; augmentation; PRF; sinus lift; osteointegration.

Dental implantation is currently one of the most reliable methods for rehabilitating patients with missing teeth. However, atrophy or resorption of the jawbone complicates implant placement. Insufficient bone volume reduces the mechanical stability of the implant and delays osteointegration. Therefore, in cases of bone deficiency, additional regenerative measures should be taken either before or simultaneously with implantation [1].

The analysis is based on clinical studies and meta-analyses published between 2018 and 2024 [2]. Implant success in patients with bone deficiency is primarily improved through the following surgical and biological approaches:

Bone Augmentation: Bone volume is restored using autografts, xenografts, or synthetic biomaterials. This process enhances implant stability.

Sinus Lift Surgery: In the upper jaw, when the sinus is positioned low, this procedure is the most effective method to increase bone volume.

PRF and Growth Factors: PRF is an autologous biological material containing growth factors derived from platelets. It accelerates angiogenesis and can reduce the healing period by 25–30%.

Biomaterial Selection: Titanium or hydroxyapatite-based implant surfaces improve osteointegration. Zirconia implants provide successful outcomes in aesthetic zones.

Analysis of the studies shows that implant success in cases with bone augmentation reaches 94–97%. In patients who underwent a sinus lift, medium-term (3–5 years) results are maintained at 92–95%. The use of PRF increases bone density, reduces inflammatory

response, and accelerates healing. Bone quality (classified as D1–D4) directly affects long-term implant success: 98% for D1–D2 types, 80–85% for D4 type.

To ensure implant success in patients with bone deficiency, several conditions must be met: adequate bone reconstruction, sterile surgical technique, use of PRF or bioactive materials, and proper postoperative care. Clinical experience shows that a combined use of these methods enhances early implant stability and guarantees long-term functional outcomes [3]. Additionally, adjunctive therapies such as laser therapy or photobiomodulation can accelerate regeneration.

Bone deficiency is a complex but solvable problem in implantology. With modern regenerative technologies (augmentation, sinus lift, PRF), implant success rates approach those seen in healthy bone. A comprehensive approach ensures 90–95% successful implant integration, accelerating the aesthetic and functional rehabilitation of patients.

Dental implantation in patients with bone deficiency presents a clinical challenge due to reduced bone volume and delayed osteointegration. However, modern regenerative strategies—such as bone augmentation, sinus lift, PRF application, and the use of bioactive implant surfaces—significantly enhance implant stability and success rates. Clinical evidence indicates that, when these approaches are applied in a combined and protocol-driven manner, implant success can reach 90–95%, even in compromised bone conditions. Adjunctive therapies like photobiomodulation further accelerate healing and improve outcomes.

A comprehensive, individualized treatment plan that integrates surgical precision, appropriate biomaterial selection, and biological support is essential to achieve predictable functional and aesthetic rehabilitation. Future research should focus on standardizing protocols and optimizing cost-effectiveness to ensure safe, reproducible, and efficient implant therapy for patients with bone deficiencies.

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