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Prevention of Post-Extraction Alveolar Resorption using Self-Donor Bone Material

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Annotation: Despite its advantages, the clinical application of autologous bone for socket preservation presents certain limitations, including increased surgical complexity, limited availability, donor site morbidity, and accelerated resorption rates compared to some xenogeneic materials. These considerations necessitate refined surgical protocols, appropriate case selection, and occasionally, combination approaches with other biomaterials to optimize outcomes.

Keywords: socket preservation, autologous bone graft, tooth extraction, alveolar ridge, dental implantology, post-extraction healing.

Introduction: Tooth extraction represents one of the most common dental procedures worldwide, with millions performed annually due to dental caries, periodontal disease, trauma, and other pathological conditions. Following extraction, a complex cascade of healing events is initiated, leading to inevitable dimensional changes in the alveolar ridge. Clinical and radiographic studies have consistently demonstrated that without intervention, the alveolar ridge undergoes significant horizontal and vertical resorption, with approximately 40-60% of the original ridge width lost within the first six months post-extraction. This physiological process, primarily mediated by osteoclastic activity and bundle bone remodeling, results in pronounced buccolingual collapse, particularly affecting the buccal aspect of the ridge due to its thinner cortical plate.

The consequences of uncontrolled post-extraction bone resorption extend beyond anatomical alterations, creating significant challenges for subsequent restorative and implant-based treatments. Diminished ridge dimensions often necessitate additional augmentation procedures to achieve adequate bone volume for implant placement, increasing treatment complexity, duration, morbidity, and cost. The predictable preservation of alveolar dimensions immediately following extraction has thus emerged as a critical strategy in contemporary dentistry, establishing socket preservation as a standard of care in sites with planned prosthetic rehabilitation.

While numerous biomaterials have been introduced for socket grafting, including xenografts, allografts, and synthetic substitutes, autologous bone remains the gold standard against which other materials are compared. Autologous bone possesses the unique trifecta of osteogenic, osteoinductive, and osteoconductive properties, containing viable osteoblasts, growth factors, and a three-dimensional scaffold that synergistically promote bone regeneration. Self-donor bone material, harvested from intraoral sites such as the mandibular ramus, symphysis, tuberosity, or even collected during implant osteotomy preparation, eliminates immunological rejection risks and provides optimal biocompatibility.

Recent advancements in harvesting techniques, including the use of bone collection devices, piezoelectric surgery, and chair-side processing methods, have significantly simplified autologous bone procurement while reducing donor site morbidity. Furthermore, the combination of autologous bone with blood derivatives such as platelet-rich fibrin (PRF) has demonstrated enhanced regenerative potential through the incorporation of concentrated growth factors and cytokines that modulate the healing response.

This review aims to comprehensively evaluate the biological principles, clinical techniques, and evidence-based outcomes of socket preservation using self-donor bone material following tooth extraction. By examining current literature and emerging protocols, this paper seeks to provide

clinicians with a framework for implementing autologous bone grafting strategies to mitigate post-extraction alveolar resorption and facilitate subsequent prosthetic rehabilitation.

Among the many available materials for bone grafting, autologous bone retains its "gold standard" position due to its unique biological properties. As the only material with simultaneous osteogenic, osteoinductive and osteoconductive properties, autologous bone grafts demonstrate the best integration and biological compatibility[4,15]. An important advantage is also the complete elimination of the risk of transmission of infectious diseases and the development of immunological reactions. Modern advances in surgical techniques and an in-depth understanding of the mechanisms of bone regeneration have made it possible to improve the methods of harvesting and using autologous bone grafts. Various donor sites, including the branch and body of the lower jaw, the chin region and the tubercle of the upper jaw, provide the surgeon with a wide range of bone sources with minimal trauma to the intervention.

Of particular importance is the choice of the optimal time for augmentation of the extracted tooth hole. Immediate plastic surgery makes it possible to maximize the regenerative potential of tissues and preserve the architecture of the alveolar process. This approach significantly reduces the need for extensive reconstructive interventions in the future and increases the predictability of subsequent implantation. The clinical significance of this problem goes beyond the immediate postoperative period and affects: Possibilities of subsequent implantation,aesthetic results of prosthetics

Modern research is aimed at improving the effectiveness of autologous bone grafts by combining them with various biological modifiers, including growth factors and platelet concentrates. The preliminary results demonstrate the prospects of this direction for accelerating regeneration and improving the quality of the formed bone tissue.

The development of digital technologies in dentistry opens up new opportunities for planning and performing operations to preserve the recess of a extracted tooth. The use of three-dimensional visualization and computer modeling makes it possible to increase the accuracy and predictability of interventions.

All of the above determines the need for a comprehensive study aimed at:

Systematization of existing treatment protocols

Evaluation of the effectiveness of various techniques

Development of optimal algorithms for choosing treatment tactics

Defining criteria for predicting results

The results of this study will optimize approaches to preserving the recess of the extracted tooth using autologous bone grafts and improve the long-term results of dental rehabilitation of patients.

The purpose of this study is to study the immediate and long-term results of bone grafting of the lower jaw after tooth extraction in women using autogenic bone grafts.

Materials and methods. The study was conducted on the basis of the Department of Maxillofacial Surgery of Samarkand State Medical University and the Department of Maxillofacial Surgery of the Samarkand City Medical Association. In the period from 2022 to 2024, 34 patients aged 18 to 65 years old who applied for inflammatory processes in the mandible were examined at outpatient and inpatient appointments. According to topographic and anatomical and etiopathogenetic characteristics, as well as the type of autograft, patients are divided into 2 groups.

The first group consisted of 16 female patients who underwent dental extractions with simultaneous installation of a connective tissue graft from the upper jaw mound.

The second group consisted of 18 female patients who, after tooth extraction, had their teeth replaced with autosteum chips obtained from the outer oblique line of the lower jaw.

During this study, the following methods were used: clinical (survey, examination, palpation, auscultation), additional (panoramic radiography, computed tomography, targeted X-rays).

The results and their discussion. In the first group of patients, after the removal of the frontal groups of teeth, an immediate dentoalveolar reconstruction technique was used using a free connective tissue graft from the upper jaw mound. In case of tooth loss along with a violation of the integrity of the hole, the aesthetic risk increases. Damage to the well is usually represented by a defect in the vestibular cortical plate due to its smaller thickness and less vascularization, so when the frontal group of teeth is removed, the vestibular wall may be partially or completely damaged. In order to prevent atrophy in the area of the extracted tooth, the bone defect was replaced with a free connective tissue graft from the upper jaw mound. This 3-layer graft (bone, periosteum, mucosa) perfectly integrated with all layers of the recipient area. Success was achieved in all cases. We believe that this technique should be widely used in the practice of a dental surgeon and the practice of maxillofacial surgery. The second group consisted of patients who had the wells of their extracted teeth replaced with autosteal chips. In this group, the goal was to use autogenic chips as a space-supporting device that stabilizes the blood clot and prevents volume reduction and destruction of the overlying soft tissues.

Thus, autogenic chips were extracted from the oblique line of the lower jaw using a bone scraper and the hole of the extracted tooth was filled with it. In addition, collagen membranes were used to seal the material in the recess of the extracted tooth.

Conclusions. According to the study of the medical history, additional research methods and statistical data, possible early and late complications after dental extraction surgery were identified. The observed aesthetic and functional deficiencies complicate the possibility of further prosthetics. It is extremely important to restore the integrity of the alveolar bone after surgery to remove teeth in the jaws. Reducing the volume of bone tissue complicates the further prosthetics of patients with removable and non-removable structures. A lack of bone tissue can lead to the inability or failure of bone tissue. Bone grafting surgery using autoclave and connective tissue grafts is effective in eliminating defects and deformities of the jaws after surgery, the removal of which provides the possibility of further full-fledged prosthetics, which leads to an improvement in the quality of life of patients.

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