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Socket Preservation Following Extraction A Review Article

[1] Dr. Vandana Shenoy, MDS
Professor,
Department of Oral and Maxillofacial Surgery,
Thai Moogambigai Dental College and Hospital,
Chennai, Tamilnadu, India

[2] Dr.Preethi. R, BDS
Intern
Department of Oral and Maxillofacial Surgery
Thai Moogambigai Dental College and Hospital
Chennai, Tamilnadu, India

[3] Dr. Udhaya Soundharya Mangai T, BDS
Intern
Department of Oral and Maxillofacial Surgery
Thai Moogambigai Dental College and Hospital
Chennai, Tamilnadu, India

[4] Dr.Laavanya, MDS
Reader,
Department of Oral and Maxillofacial Surgery,
Thai Moogambigai Dental College and Hospital,
Chennai, Tamilnadu, India

[5] Dr. Mohamed Afradh, MDS
Reader,
Department of Oral and Maxillofacial Surgery,
Thai Moogambigai Dental College and Hospital,
Chennai, Tamilnadu, India

Abstract:- Dental extraction is a regular procedure, routinely carried out in any dental set up. After tooth extraction, the alveolar ridge will undergo morphological changes and decreases in volume. These changes are usually clinically significant and can make placement of a prosthesis or an implant-supported crown difficult. Recent advances in bone grafting allow the dentist to place implants in sites that were considered compromised in the past. This article focuses on the healing pattern of sockets, types of grafts and membranes, patient selection, pre surgical and surgical procedures.

Keywords:- *Alveolar Ridge, Bone Grafting, Tooth Extraction.*

I. INTRODUCTION

Alveolar bone is a tooth dependent structure and its topography is determined by formation of teeth and axis of eruption. After tooth extraction, bundle bone is resorbed due to lack of nutritive support from the periodontal ligaments. Hence, dimension of extracted socket resorb vertically and horizontally which compromise the esthetics and function of the patient. Socket preservation following extraction facilitate the preservation of the alveolar architecture to prevent hard and soft tissue collapse and minimize or eliminate the necessity for future augmentation procedures.

II. SOCKET ALVEOLUS HEALING:

Immediately after a tooth extraction there will be a series of activated inflammatory reactions. Blood from the surrounding vessels, which contains proteins and injured cells, fills the socket. Within the first 24 hours, these cells set in motion a sequence of processes that result in the production of a fibrin network and platelets, which together form a "blood clot" or "coagulum" [1]. This coagulum controls the transport of growth factors as well as cells. To clean the wound, neutrophils and macrophages penetrate the area of the wound and consume germs and tissue fragments. They discharge cytokines and growth factors that will stimulate and intensify mesenchyme cell migration and their synthesis within the coagulum [2]. The blood clot starts to dissolve after a few days (fibrinolysis). Gradual replacement of granulation tissue occurs over the course of 2-4 days as a result of mesenchyme cell growth [3]. A vascular network forms at the end of the first week, and by the end of the second week, the marginal area of the extension socket will be covered by young connective tissue, which is abundant in arteries and inflammatory cells [4]. By 4-6 weeks, the alveolus is mostly made up of woven bone, and the soft tissue has begun to keratinize. After 4-6 months, layers of lamellar bone are deposited on the previously created woven bone to replace the mineralized tissues inside the socket.

Major changes in the removed socket occur over the first year, with two-thirds of the bone loss occurring within the first three months.

Although bone deposition in the socket will continue for several months, it will not reach the level of the coronal bone of the surrounding teeth [5].

Due to the restoration of the buccal bone plate, the buccolingual dimension of the alveolar ridge will often be reduced by 50% after healing of the removed socket. The buccal wall degenerates more than the lingual wall because the buccal bone is mostly made up of bundle bone, which becomes inactive after extraction since it no longer receives nutritional input from the periodontal ligament [6].

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III. TYPES OF GRAFT:

It is divided into four categories based on the origin of the grafting material [7]

- Autogenous grafts (autografts): Material is transplanted from one spot to another within the same individual. Depending on the place of harvest, a graft may be intraoral or extraoral.
- Allografts: Materials from a donor of the same species are transplanted. Freeze-dried bone grafts, which can be mineralized or demineralized, are the most popular type of graft.
- Xenografts: Appropriately treated material is transferred from a donor of a different species. Deproteinized bovine bone mineral that is primarily porous. (Bio-Oss, geistlich collagen)
- Alloplasts: Artificial materials that are typically inert and are used in place of bone grafts.

Other substances employed include Emdogain, platelet-rich plasma, titanium-prepared platelet-rich fibrin (T-PRF), platelet-rich fibrin (PRF), bone morphogenetic protein (BMP), and platelet-rich fibrin (PRF) [8, 9].

Platelet Rich Plasma is defined as a portion of the plasma fraction of autologous blood with a platelet concentration above the baseline (before centrifugation) [10]. Platelet rich plasma (PRP) was used to introduce concentrated growth factors like transforming growth factor-beta (TGF-β),platelet-derived growth factor (PDGF), and insulin-like growth factor 1 (IGF-1) to the surgical site, enriching the natural blood clot to speed up the wound healing and stimulate bone regeneration [11]. It is enriched by Growth factors, chemokines, cytokines, and other plasma proteins [10].

Platelet rich fibrin (PRF) is a fibrin matrix in which platelet growth factors, cytokines and cells are trapped and may be released after a certain time and which serves as a resorbable membrane [11].

Leukocyte-Platelet-rich fibrin (L-PRF) was first defined by Choukroun el al. [12] in France, and it has a simplified preparation protocol. Slow polymerization of PRF allows the accumulation of numerous growth factors like Platelet-Derived Growth Factor (PDGF), Vascular Endothelial Growth Factor (VEGF), Transforming Growth Factor beta (TGFβ), Insulin-like Growth Factor (IGF), cytokines like IL-1β, IL-4, IL-6 and Tumour Necrosis Factor-α (TNF-α) into the fibrin mesh. This fibrin mess allows more cell migration, proliferation, and tissue healing. By slow and gradual release of these factors, hard and soft tissue healing is improved. Its advantages are ease of preparation, low cost and lack of biochemical handling of harvested blood [13]. Numerous growth factors, including Platelet-Derived Growth Factor (PDGF), Vascular Endothelial Growth Factor (VEGF), Transforming Growth Factor beta (TGF), Insulin-like Growth Factor (IGF), and cytokines like IL-1, IL-4, IL-6 and Tumor Necrosis Factor-(TNF-), can accumulate in the fibrin omesh due to the slow polymerization of PRF. More cell migration, proliferation, and tissue repair are possible because of this fibrin mess. The repair of both hard and soft tissues is facilitated by the slow and steady release of these substances. Its benefits include convenience of preparation, minimal cost, and no biochemical processing of obtained blood [13].

➢ *Advantages of PRF over PRP [14]*

There is no biochemical handling of the blood during PRF preparation. It is simplified and cost-effective process. Use of bovine thrombin and anticoagulants not required in PRF. Favorable healing due to slow polymerization and more efficient cell migration and proliferation. PRF has supportive effect on immune system and helps in hemostasis.

➢ *Preparation of PRF:*

In order to prepare the PRF, a patient's venous blood volume of 6 to 10 mL was drawn using an 18 G sterile needle. The original volume of blood was divided evenly between two tubes without the addition of any anticoagulant, and these tubes were then spun at a centrifuge at a speed ranging from 2200 to 3000 rpm for three minutes, depending on the volume of blood at room temperature of 22 °C. A sterile petri dish was covered with a sheet of gauze that had been treated with paraffin. A clean collagen dry sheet was then placed on top of that. The supernatant was then separated by centrifugation. It was instantly and gradually poured over the ready-made petri dish, then left for around 20 minutes. The membrane initially had a clear, thin yellow fluid; however, as it matured, it became more yellowish and had a gelatinous consistency. Without using any physical handling, this membrane was applied directly to the wound as a dressing, together with paraffin-impregnated gauze and collagen sheet.

IV. TYPES OF MEMBRANES:

Quality of Socket healing in the presence of barrier membrane is better, mainly for implant placement [15]. Barrier membranes come in a huge range of varieties such as collagen, polyglycolic acid, expanded polytetrafluoroethylene (ePTFE) and polyglactin 910. However, these are classified under 2 major types: nonresorbable and resorbable membranes [16].

• Non-resorbable membrane: (ePTFE, Titanium-reinforced Gore-Tex) [17]

Advantages: Remain intact till removal; Attached with ease using titanium or resorbable tacks; Greater bone fill if membrane isn't exposed; Minimal tissue reaction if membrane isn't exposed

Disadvantages: needing a second surgery to remove it; increasing patient morbidity; needing removal if exposed; and method sensitivity.

• Resorbable membrane: (Neomem, Bio-guide, ossix) [17]

Advantages: Does not need to be surgically removed; reduces patient morbidity; improves soft-tissue healing; causes a tissue-friendly reaction if membrane is exposed; is affordable; does not need to be removed if exposed.

Disadvantages: difficulty tacking down; somewhat less bone fill than nonresorbable membranes; potential for tissue inflammation to obstruct healing and GBR; and method sensitivity.

V. PATIENT SELECTION

A. Indication:

- Periodontal disease.
- Root damage.
- The failure of endodontic therapy and extensive caries.
- People who are getting implants to replace lost teeth are regular candidates for dental bone grafts.
- Dental bone grafting restores bone density to a region of the jaw that has lost it due to tooth loss or gum disease. Because adjacent teeth may suffer from bone loss, strengthening the jaw with a bone transplant can help stop future bone loss and its long-term health effects.
- Bone grafting is done for the people who is concerned about the esthetics of their face. Lose in bone mass in the jaw can make the face appear shorter. Without healthy bone structure underneath them, the lips and muscles around them can change in appearance and the skin in the jaw area can appear more wrinkled.

B. Contraindication:

- Patients with acute periapical or periodontal infections are contraindicated.
- Bone metabolic disorders.
- Pregnancy.
- A history of cancer.
- Radiotherapy or chemotherapy for cancer in the last five years.
- Immune system disorders.
- Prolonged use of steroids or antibiotics.
- Smokers (more than 10cigarettes per day).

VI. PRE & POST-SURGICAL EVALUATION:

Before any surgical procedures periapical radiographs, clinical photographs, study casts, and clinical examinations of the extraction sites should be done. Oral hygiene instructions should be given [19]. Postoperative clinical evaluations of the patients should be done at 1, 7, 30, and 90 days. After 6 months, all sockets were evaluated through clinical and radiographic examination [19, 20].

VII. CONCLUSION

In recent times implant became the most common treatment option for replacement of teeth. The success of dental implants depends on whether there is a sufficient volume of healthy bone in the recipient site at the time of implant placement. Alveolar ridge resoption also affect the esthetics and make it difficult to fabricate the prosthesis. Thus, it seems necessary to prevent alveolar ridge from destruction and preserve it during extraction procedure.

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