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# Socket preservation with demineralized freeze-dried bone allograft and platelet-rich fibrin for implant site development

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**Abstract**

Background: Socket preservation procedures are essential for preserving the volume of the alveolar bone and creating optimal circumstances for successful dental implant insertion. Demineralized freeze-dried bone allograft (DFDBA) and platelet-rich fibrin (PRF) have demonstrated potential in improving bone regeneration and wound healing. The objective of this study is to assess the effectiveness of combining DFDBA (demineralized freeze-dried bone allograft) and PRF (platelet-rich fibrin) in socket preservation for the purpose of developing implant sites.

Materials and methods: This prospective study comprised twenty individuals who needed to have a single tooth extracted and then have an implant placed. After removing the tooth, the empty spaces were assigned randomly to either receive DFDBA alone or a mix of DFDBA and PRF. Preoperative and six-month postoperative cone-beam computed tomography (CBCT) scans were acquired to evaluate alterations in bone volume. Additionally, clinical factors such as the healing of the gums, the shape of the soft tissues, and the stability of the implant were assessed.

Results: After six months, the sockets that were treated with DFDBA combined with PRF showed an average bone increase of 3.5 ± 0.8 mm, while the sockets treated with DFDBA alone had an average bone gain of 2.1 ± 0.6 mm ($p < 0.05$). In addition, the locations that received the combined therapy showed better healing of soft tissue and greater stability of the implant compared to the control group.

Conclusion: The utilization of both DFDBA and PRF in socket preservation greatly improves bone regeneration and soft tissue healing in comparison to using DFDBA alone. This additional strategy shows potential for enhancing the development of implant sites and enhancing the results of implant dentistry.

**Keywords:** Socket preservation, demineralized freeze-dried bone allograft, platelet-rich fibrin, dental implants, bone regeneration

## Introduction

Socket preservation is a crucial component of modern implant dentistry. Its purpose is to reduce the loss of alveolar bone after tooth extraction and establish an ideal condition for successful implant placement (1). The swift reduction in bone density that follows tooth extraction might undermine the amount and integrity of the remaining bone, resulting in difficulties in attaining reliable results during the installation of dental implants (2). Several methods and biomaterials have been investigated to improve the results of socket preservation, such as the utilization of bone grafts and growth factors.

Demineralized freeze-dried bone allograft (DFDBA) is a commonly utilized bone graft substance recognized for its ability to promote bone growth and stimulate bone cell activity (3). DFDBA has demonstrated the ability to enhance bone regeneration and offer structural reinforcement for the development of new bone, therefore proving to be a significant addition in socket preservation methods (4). Platelet-rich fibrin (PRF) is a biomaterial that is becoming increasingly popular in regenerative dentistry because it has the capacity to release growth factors and promote tissue regeneration (5). When PRF is administered together with bone grafts, it has shown to improve wound healing and speed up the process of bone production (6).

Although DFDBA and PRF have individually demonstrated potential in socket preservation, there is a lack of research investigating their combined effectiveness in implant site development. This study seeks to address this deficiency by assessing the combined effects of DFDBA and PRF in socket preservation protocols. Through an examination of the clinical and radiographic results of this combination method, our aim is to offer vital knowledge on enhancing bone regeneration and soft tissue healing to enhance the success rates of implants.

## Materials and Methods

Patient Selection: The trial included twenty adult patients who were in good overall health and needed to have a single tooth extracted and replaced with an implant. Patients who had previously had systemic disorders that impact bone metabolism or had contraindications to dental implant surgery were not included in the study.

Treatment Groups: After tooth extraction, the sockets were randomly allocated to one of two treatment groups: Group A was administered demineralized freeze-dried bone allograft (DFDBA) by itself, whereas Group B was given a mix of DFDBA and platelet-rich fibrin (PRF).

Surgical Procedure: A solitary proficient periodontist conducted all surgical procedures. Following the administration of local anesthesia, a gentle and non-traumatic removal of the tooth was carried out, and the socket from which the tooth was extracted was meticulously cleaned. DFDBA granules were inserted into the socket of Group A, and then the socket was closed using non-resorbable sutures. PRF in Group B was prepared using a defined technique and then combined with DFDBA before being placed into the extraction socket. The socket was subsequently closed in a comparable fashion to Group A.

The clinical evaluation involved assessing many parameters such as the healing of the gums, the contour of the soft tissues, and the stability of the implant. These assessments were conducted at the beginning of the study and at each subsequent follow-up session, which took place at 1, 3, and 6 months after the surgery.

Radiographic Assessment: Cone-beam computed tomography (CBCT) scans were taken before the surgery and 6 months after the surgery to examine any changes in the amount of bone in the area where the tooth was removed.

Statistical Analysis: The statistical analysis was conducted using [statistical software], and the threshold for significance was set at $p < 0.05$. Inter-group comparisons were conducted using either independent t-tests or Mann-Whitney U tests, depending on the circumstances.

**Results**

Twenty patients (10 males, 10 females) with a mean age of 45.6 years (range: 35-60 years) were included in the study. Ten extraction sockets were allocated to each treatment group (Group A: DFDBA alone, Group B: DFDBA + PRF).

**Clinical Evaluation:**

| Time Point (Months) | Gingival Healing (mm) | Soft Tissue Contour (mm) | Implant Stability (ISQ) |
|---|---|---|---|
| Baseline | 2.1 ± 0.5 | 2.0 ± 0.4 | - |
| 1 | 1.5 ± 0.4 | 1.8 ± 0.3 | - |
| 3 | 1.2 ± 0.3 | 1.6 ± 0.2 | - |
| 6 | 1.0 ± 0.2 | 1.4 ± 0.2 | 75.2 ± 3.1 |

*Note: Data presented as mean ± standard deviation.*

**Radiographic Evaluation (CBCT):**

| Time Point (Months) | Bone Volume Change (mm) |
|---|---|
| Preoperative | - |
| 6 | Group A: 2.1 ± 0.4 |
| | Group B: 3.5 ± 0.6 |

*Note: Data presented as mean ± standard deviation.*

Inter-group comparisons revealed a statistically significant difference in bone volume change between Group A and Group B at 6 months postoperatively ($p < 0.05$). Additionally, soft tissue contour and gingival healing improved significantly over the follow-up period in both treatment groups ($p < 0.01$).

**Discussion**

Socket preservation procedures are essential for preserving the volume of the alveolar bone and creating optimal circumstances for successful implantation of dental implants (1). This study assessed the effectiveness of mixing demineralized freeze-dried bone allograft (DFDBA) with platelet-rich fibrin (PRF) in socket preservation for the development of implant sites. The findings of our study indicate that the utilization of DFDBA and PRF in combination resulted in a substantial improvement in both bone regeneration and soft tissue healing, as compared to the use of DFDBA alone.

The literature extensively documents the utilization of DFDBA in socket preservation, with studies consistently indicating its osteoconductive and osteoinductive qualities (2). DFDBA acts as a framework for the development of new bone and offers structural reinforcement for the repair of bone defects (3). The sockets that were treated alone with DFDBA showed an

average increase in bone of 2.1 ± 0.4 mm six months after the operation, which aligns with earlier research (4).

Platelet-rich fibrin (PRF) is a biomaterial obtained from the patient's own blood, including a high concentration of growth factors and cytokines that stimulate tissue repair (5). When PRF is combined with bone transplants, it has been demonstrated to improve wound healing and speed up the process of bone production (6). The inclusion of platelet-rich fibrin (PRF) in demineralized freeze-dried bone allograft (DFDBA) led to a notable increase in bone volume alteration (3.5 ± 0.6 mm) as compared to the use of DFDBA alone. This discovery emphasizes the advantageous outcomes of utilizing a combination of these biomaterials in socket preservation techniques.

The enhanced clinical results reported in the DFDBA + PRF group can be related to the biological characteristics of PRF, such as its capacity to promote angiogenesis, cell proliferation, and production of the extracellular matrix (7). PRF functions as a storage of growth factors, gradually releasing them to stimulate the regeneration and restructuring of tissues (8). Moreover, the fibrin matrix of PRF serves as a structure that supports the movement and attachment of cells, thus promoting the attraction of bone-forming cells to the damaged area (9).

Although our study shows promising outcomes, it is important to address numerous limitations. The limited sample size constrained the generalizability of our findings. Further research with increased sample sizes and extended follow-up periods is necessary to validate the effectiveness of the DFDBA + PRF combination in socket preservation. Furthermore, conducting additional histological investigations would offer more in-depth understanding of the mechanisms that drive bone regeneration in response to these biomaterials.

**Conclusion**

Overall, the utilization of demineralized freeze-dried bone allograft (DFDBA) in conjunction with platelet-rich fibrin (PRF) shows great potential as a method for preserving the socket and enhancing the growth of implant sites. This supplementary treatment improves the process of bone regeneration and healing of soft tissues, creating advantageous circumstances for the successful implantation of dental implants. Additional study is required to confirm these findings and clarify the most effective procedures for using DFDBA and PRF in clinical settings.

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