CASE REPORT

# Free Gingival–Bone Graft in the Anterior Maxilla: A Clinical Case Report

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## Abstract

**Aim:** To present the healing, development, and long-term clinical results after a combined gingival–bone graft as an alternative treatment for the management of critical extraction sites in the esthetic zone.

**Background:** To enhance the knowledge of *in vivo* soft and hard tissue remodeling, in this case report, we observed the healing, development, and long-term clinical results after a case of a combined gingival–bone graft as an alternative treatment for the management of critical extraction sites.

**Case description:** Autogenous grafts of gingival and bone tissue were placed in a 56-year-old female patient, where a hopeless upper left central incisor with an evident loss of both the buccal and the palatal bony plates and with endodontic problems was due for extraction. In order to obtain enough autogenous tissue for filling the defect, a cylindrical free gingival and bone graft was retrieved from the retromolar area with a trephine drill, to obtain hard and soft tissues for grafting the postextraction defect. After 6 months, following soft tissue maturation and once esthetic and natural gingival contours were achieved, the surgical site was prosthetically restored with a porcelain fused to a metal bridge and scheduled for regular follow-up.

**Conclusion:** No complications were observed either from the donor site or from the recipient site. The post-treatment result was esthetically pleasing, based upon successful architectural stability of both hard and soft tissues. Although more studies are needed to confirm the beneficial use of this approach, the procedure can be considered a viable option in the management of soft and hard tissue remodeling in esthetically compromised cases.

**Clinical significance:** The gingival–bone graft may be considered as an alternative treatment for the management of critical extraction sites in the esthetic area.


**Keywords:** Alveolar bone grafting, Fixed partial denture, Gingival graft, Piezo surgery, Pontic, Tooth extraction, Tooth socket.

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## Introduction

The alveolar process is formed during tooth eruption[1] and undergoes atrophy after the loss of single or multiple teeth.[2] Alteration of the ridge occurs concomitantly with the healing of the soft and hard tissues, but remodeling may also continue after *de novo* bone formation within the socket.[3]

Several surgical techniques have been proposed to achieve bony or gingival augmentation for modeling the socket healing process following the extraction and for the reconstruction of the lost papillae.[4,5] In order to compensate simultaneously both the volume of the hard and soft tissues, a newly developed technique has been introduced,[6] which consists of a one-piece graft retrieved with gingiva and bone. This approach was introduced primarily for reconstructive periodontal surgery and to obtain primary closure of the flap after tooth extraction.

The aim of this case report is to observe the healing, development, and long-term clinical results after a case of gingival–bone graft as an alternative treatment for the management of critical extraction sites, where esthetics is of prime concern.

## Case Description

A 56-year-old nonsmoking female presented for esthetic restorative care. Discussion with the patient revealed that the shape, color, and chipping of the existing prosthetic rehabilitation in the esthetic area, as well as lost social confidence, were her main concerns. The intraoral (Figs 1A and B) and radiographic (Fig. 1C) examination revealed an unsatisfactory porcelain-fused-to-metal fixed partial denture (FPD) in the anterior maxilla, with evident loss of both the buccal and palatal bony plates, and an extensive carious lesion on the coronal third of the root of the upper left central incisor. The periodontal probing depths were 5 to 6 mm in this area. As a result, the incisor was considered hopeless.

The patient was medically screened, and no major diseases or medications, which may affect the final outcomes, were found. No signs of parafunctions or muscular disease and no deleterious habits were noticed upon occlusal observation and analysis;

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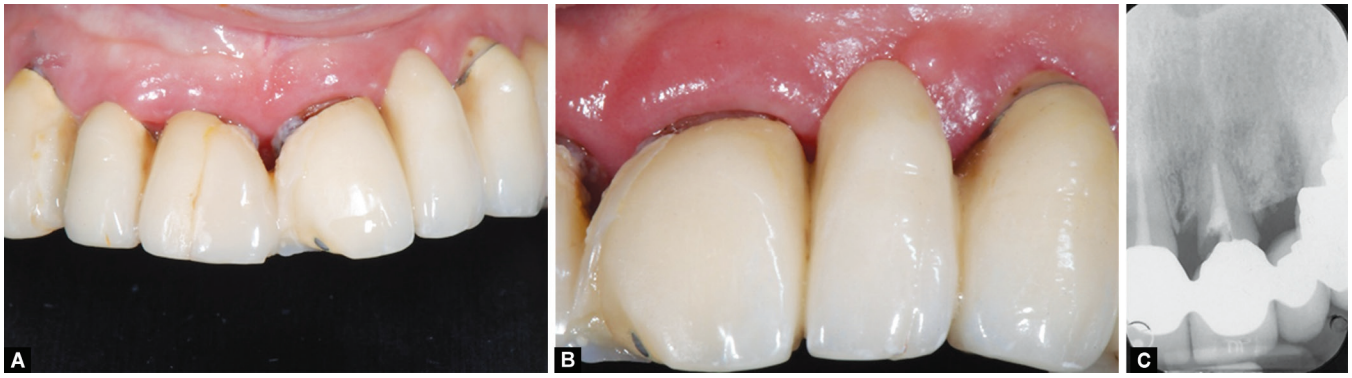


**Figs 1A to C:** Preoperative view displaying extensive unsatisfactory restorations; (B) Close-up; (C) Preoperative periapical radiograph confirming the external root resorption at the upper left central incisor

the temporomandibular joint appeared stable, and mandibular movements well preserved. Full-mouth plaque score as well as full-mouth bleeding score were <25%; thus, the patient was considered periodontally stable.

Treatment limitations and options were discussed with the patient. General information about the protocol, material selection, and hygiene was discussed extensively, and informed consent with clear indications as to risks and benefits was obtained from the patient. The patient agreed to undergo the procedure and declared her willingness to return at regular intervals for the evaluation.

Before the scheduled appointment for the surgery, the patient underwent an oral hygiene prophylaxis, and instructions for oral maintenance were given. One day before the surgery, the patient commenced antibiotic therapy with amoxicillin and clavulanic acid of 1 gm for every 12 hours. The depth and anatomy of the defect and the site for gingival–bone graft retrieval were evaluated by accurate radiographic examinations. All surgical procedures were performed by the same operator, by an experienced oral surgeon, with the use of 4.3 × 400 surgical head-worn loupes. Local anesthesia was administered at both the donor and recipient sites; prior to tooth extraction, the surrounding gingival margins were de-epithelized with a sterile water-cooled diamond rotating bur, in order to expose the vascularized lamina propria and connective tissue responsible for nourishing and vascularizing the grafted tissues and to favor primary wound healing (Figs 2A and B). The tooth was then extracted with forceps without mucoperiosteal flap elevation. An ultrasonic device (Piezosurgery, Mectron, Carasco, Genova, Italy) was used to debride unwanted inflammatory tissue and the remnants of periodontal ligament fibers from the fresh socket. The periosteum of the soft tissues surrounding the entire site was slightly separated from the bony crest, to a depth of a few millimeters using a small flap elevator without releasing incisions in order to maximally preserve the blood supply. This was done to allow for satisfactory mobility of the gingival tissue and to allow better adaptation to the shape of the graft. The graft was selected with an adequate diameter and dimension in such a way that it would be a stable fit within the defect. The postextraction defect was developed in overall shape, width, and depth using a set of trephine burs with diameters of 5, 6, 7, 8, 9, and 10 mm. Each trephine was used as a probe, inserting them as deep as possible into the postextractive alveolus and starting first with the 5 mm trephine in a growing progression, until the recipient site dimension best corresponded to the diameter of the trephine and graft diameter (Fig. 2C). The trephine burs had an internal diameter of 1 mm less than the external diameter. The trephine best chosen for fit had an external diameter of 8 mm; therefore, a 9 mm trephine was used to retrieve the graft in order to obtain a corresponding 8 mm graft cylinder. The trephine bur was mounted on a low-speed angulated trepan under sterile saline cooling and cuts both gingival soft tissue and bone with a speed of 2000 rpm.

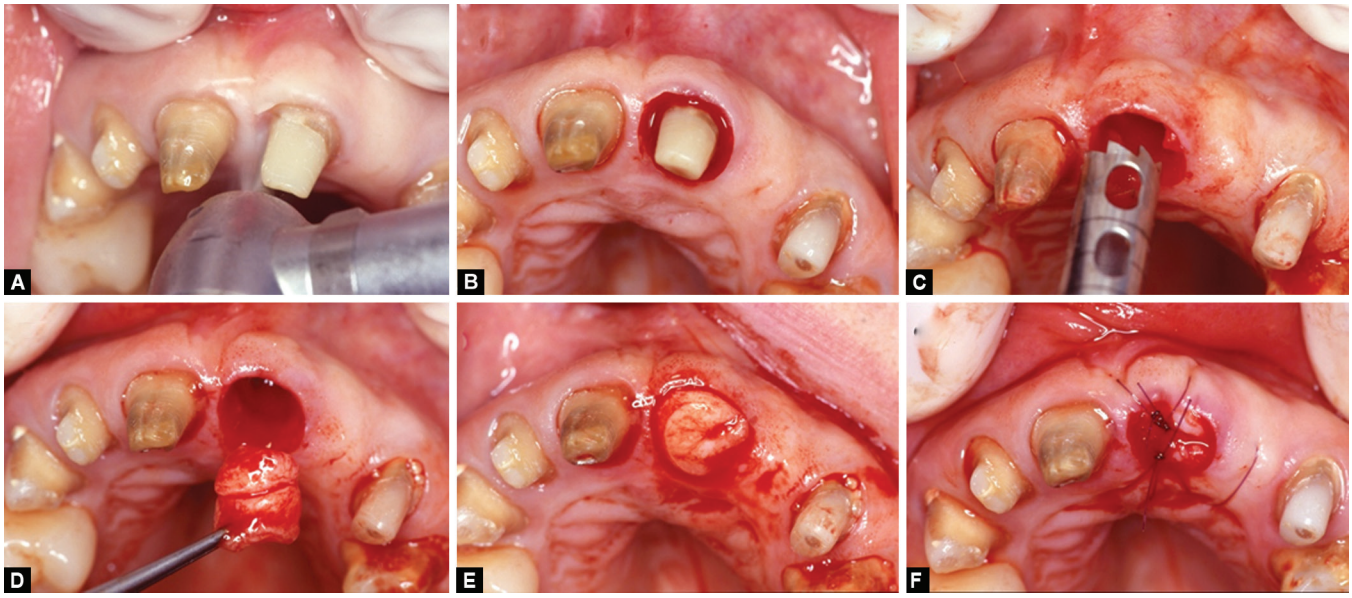
An intraoral donor site with enough available bone and gingival tissue was required, and for this reason, an accurate clinical and radiographic evaluation was necessary. In harvesting the graft, it was very important to respect the anatomical structures of the area of the donor site, such as roots of proximal teeth, alveolar nerve, and maxillary sinus. Similarly, the palatal aspect of the molars should be approached with care, due to the presence of nearby vascular and neural structures.

The selected donor site was an area in the posterior maxilla, where it was easy to find and retrieve enough available tissues. After drilling into the cortical bone of the maxillary sinus floor, the graft remained within the hollow trephine and was easily retrieved by pushing it out from the trephine with a periodontal probe. The donor site was simply closed with sutures after tissue retrieval, and healing was evaluated every 3 months for 1 year.

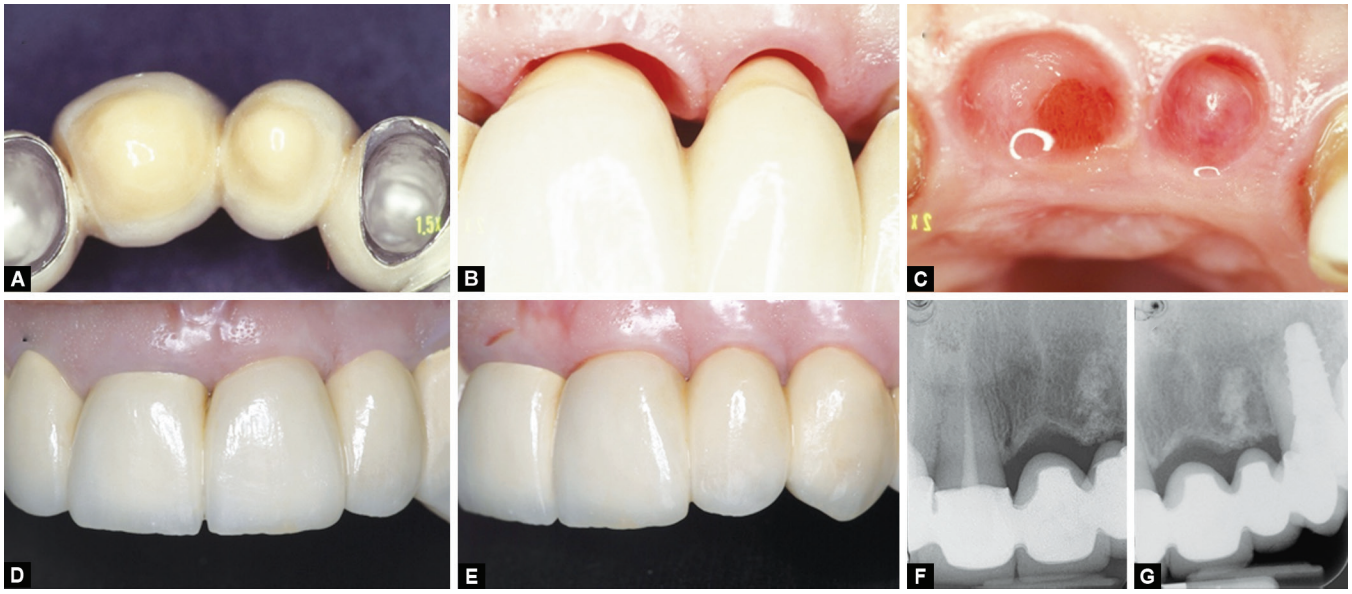
The free gingival–bone graft was then placed in the postextractive socket (Figs 2D and E). The gingival part of the graft was secured in place with a 5/0 resorbable suture. The needle was inserted from the gingival part of the graft to the gingival walls of the socket in order to avoid uncontrolled forces that could detach the gingival part from the bone part of the graft (Fig. 2F). For an optimal result, the sutured gingival margins had to fit very well. The sutures were removed after 14 days.

Postoperative recovery was uneventful. No major or minor complications nor excessive discomfort were recorded or noticed by the patient.

Guided soft-tissue healing and gingival contour shaping were optimized through the use of a temporary bridge with an ovate pontic. Following tissue maturation, after 6 months, the site was restored with a porcelain-fused-to-metal FPD (Figs. 3A to C) The patient underwent a rigorous follow-up maintenance in particular through professional oral hygiene sessions and regular follow-up review every 6-months. The patient was examined clinically and radiographically by two independent dentists (Figs. 3D to G). Radiographs were taken with the standardized long-cone technique and examined at 4.3 × 400 magnification with surgical head-worn loupes. After 2 years, the results appeared stable over time, with total preservation of the newly achieved volumes in the surgical site. Furthermore, the prosthetic soft tissue-shaping procedures



**Figs 2A to F:** De-epithelizing of the surrounding gingival margins of the upper left central incisor immediately before tooth extraction with a sterile water-cooled diamond rotating bur; (B) 21 after de-epithelization; (C) Final trephine bur; (D) Soft tissue–bone graft; (E) Placement of the soft tissue–bone graft procedure necessary to prepare the gingiva for the pontic site; (F) The sutures securing the graft in place



**Figs. 3A to G:** Porcelain-fused-to-metal (pontic areas) final restoration; (B) Fitting of the definitive restoration with ovate pontic; (C) Occlusal view of the tissue maturation shoving a scalloped gingival architecture at the pontic sites; (D) Final result, frontal view; (E) Final result, lateral view; (F) Sixmonths postsurgical radiograph showing stable bone level with no-minimal bone remodeling; (G) Twenty-four-month postsurgical radiograph showing stable bone level with no-minimal bone remodeling

achieved an optimal labial marginal tissue morphology, an esthetic integration of the emergence profile of the pontic and pericoronal soft tissue stability.

## Discussion

Although several techniques have been proposed in order to achieve bony or gingival augmentation for implant placement or supporting the tissues in the anterior maxillae, few attempts at grafting composite gingival and bone tissue have been made.[7,8] The considered novel technique of an autogenous-free gingival–bone graft in one block aims to achieve a concurrent bone and gingival augmentation and a primary seal of the extraction site.

In all graft techniques, the achievement of a primary seal is considered very important.[9] In this respect, a modified ridge preservation technique called "socket seal surgery" was proposed, which combined demineralized freeze-dried bone allograft or powdered autogenous bone as materials used to fill the bone defect and a keratinized soft tissue graft retrieved from the palate

in order to obtain a primary seal.[10] The same author presented a novel approach to this problem, in which socket seal surgery was performed simultaneously with implant placement, to achieve optimal replacement of an extracted maxillary anterior tooth, thereby reducing the time needed for healing and the number of surgical steps.[10]

The described autogenous-free gingival–bone graft revealed very fast healing and integration of the graft, confirmed by clinical long-terms results. Fast healing of the graft is useful as it reduces the time needed to obtain gingival and bone augmentation for papilla reconstruction.

An interesting observation in our study was a probing depth reduction and gain in height of the interproximal papilla, obtained when a gingival–bone graft was performed to cover exposed roots and to elevate the interproximal papilla. This is in accordance with previous studies, which observed, after crown or implant placement, the achievement of an anatomically correct and esthetic interdental papilla when the normal sulcus depth of adjacent teeth and thick gingival tissue over thick bone was present.[11,12] This could be a result of the free gingival–bone graft performed, but also a consequence of tissue development following prosthetic finalization. In fact, studies dealing with the presence or absence of interdental papilla indicate that higher crestal bone level can favor the esthetic result, reducing the distance from the interproximal contact point of the crowns to the crest of bone, and follow-up studies conducted on functionally loaded implants revealed a good maturation of the surrounding tissues over time.[13]

Our study also suggests that artificial cylindrical infrabony defects in the human jawbone of 5 to 8 mm in diameter may heal spontaneously, with an almost complete reconstruction of the anatomy of the donor site, when the crestal bone is wide enough, and all the bony walls of the defect are present after the free gingival–bone graft retrieval. The healing of artificial holes in the human jawbone has been studied previously, revealing the ability of artificially-prepared 2.5 mm diameter infrabony defects to heal spontaneously in 6 months.[14] Moreover, during spontaneous bone healing, a critical distance ("osteogenic jumping distance") was identified, above which the bone repair takes place with lamellar bone deposition.[15] Our study also suggests that when the ridge is thin, the spontaneous healing of cylindrical artificial defects of 6 to 8 mm that have lost one or two bony walls may occur with a loss of bone and gingival tissue.

## Conclusion

It can be concluded that this surgical procedure for the management of critical extraction sites in high-demand esthetic areas may provide an alternative to conventional techniques. Good clinical and radiographic long-terms results and soft tissue stability around prosthetic restorations were achieved and maintained after a 2-year follow-up. Moreover, this technique of an autogenous-free gingival–bone graft does not expose the patient to high levels of morbidity or discomfort. The execution of evidence-based and biologically acceptable surgical and prosthetic protocols was responsible for a good esthetic result in this particular case. Due to the inherent limitations of a case report, randomized controlled clinical studies are needed to validate the procedure and its benefits and to validate this technique.

## Clinical Significance

The autogenous gingival–bone graft may be considered as a viable alternative treatment for the management of critical extraction sites in the esthetic area.

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