

CASE REPORT

The utilization of vascularized pedicle combination epithelial-sub epithelial tissue graft for socket preservation in the esthetic zone—A novel approach

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Abstract

The vascularized tunneled combine epithelialize-subepithelialize connective tissue graft may yield biological outcomes superior to those achieved separately by rotated vascularization or combination interposition onlay tissue graft. This technique may provide clinicians with pathway to improve socket seal by improving the vascularity and the volume of the tissue seal, which would be paramount for the definitive esthetic and functional outcome for modern demand of our patients.

KEYWORDS

connective tissue graft, epithelial-subepithelial connective tissue graft, socket seal, socket preservation, tunneled connective tissue graft

1 | INTRODUCTION

To achieve a natural dental implant prosthetic rehabilitation is the ultimate goal of a clinician, especially concerning those in the anterior maxilla. The esthetic demands of our patients and the desire of clinicians to meet that demand have hitherto yielded successful modalities and techniques.

The cornerstones of successful techniques are the preservation of the natural architecture of the alveolar ridge, and soft tissue quality and volume.

Management of the soft tissue gap after tooth extraction is of utmost importance to the esthetic and functional outcomes of the prosthetic.

Utilization of a connective tissue graft to close the gap through socket seal surgery seals and provides protection to the socket and eliminates the need for undesirable flap manipulation for precise closure¹ and migration of mucogingival line coronally²; however, the blood supply to the autologous soft tissue graft (STG) becomes compromised in the receiving bed as it is limited to the gingival wall of the extraction socket. The compromised blood supplies diminish the probability of STG survival and adversely affect the socket architecture.³

The rotated pedicle palatal connective tissue flap (RPPCTF) technique has been utilized⁴ to augment the soft tissue around the immediate abutment and following socket preservation after tooth extraction to improve the vascularity of the tissue graft and, ultimately, its survival (Figures 1 and 2).^{5,6}

The latest technique utilizes a combination onlay-interpositional graft with one or two pouches to receive the inlay portions of the combination graft (Figures 3 and 4).³

As all previous modalities were found to be valid and to feature their own advantages, the present report presents a new approach applied to a clinical case that combines the benefits of all aforementioned modalities and techniques.

1.1 | Purpose

We present a new approach that combines the benefits of multiple modalities in an attempt to build upon previous techniques.

1.2 | Hypothesis

The vascularized tunneled combined epithelialized-subepithelialized tissue connective tissue graft may yield biological

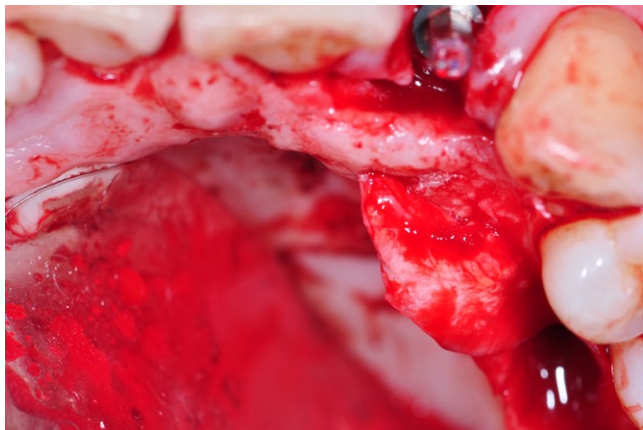


FIGURE 1 The rotated pedicle connective tissue graft (PCTG)



FIGURE 3 The combination interposition graft

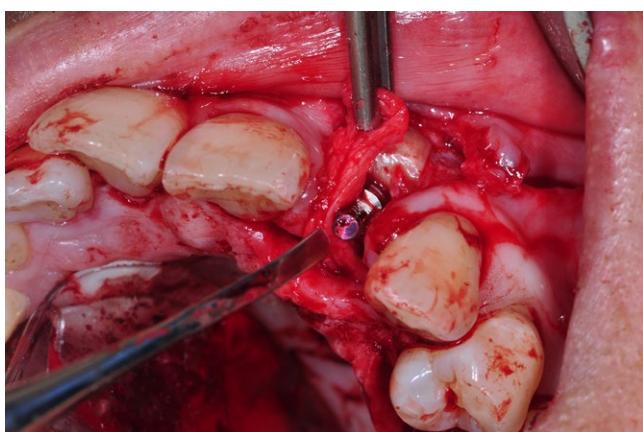


FIGURE 2 Rotated pedicle palatal connective tissue flap technique (RPPCTG)

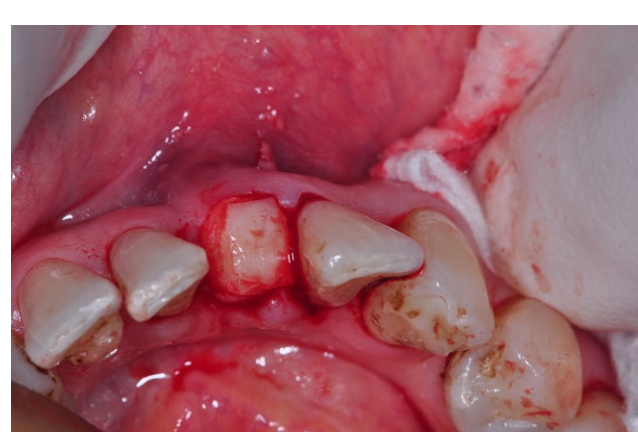


FIGURE 4 The placement of the combination graft

outcomes superior to those achieved separately by rotated vascularization and combination onlay-interpositional tissue graft.

2 | MATERIAL AND METHODS

2.1 | Clinical procedure evaluation

A male 57-year-old patient presented to my practice in March 2017. The patient was a current smoker with controlled hypertension and had been diagnosed with a cracked maxillary right central incisor 3 years prior. The condition of the maxillary right central incisor was the patient's chief concern. After a comprehensive evaluation, the tooth was deemed nonsalvageable (Figure 5), and a future dental implant prosthetic restoration was planned after the patient was consulted and his consent was obtained. On March 30, 2017, the patient underwent periodontal nonsurgical treatment and smoking cessation counseling. The vascularized pedicle epithelial-subepithelial tissue graft was explained to the patient, and the patient gave his consent to the treatment.

2.2 | Surgical technique

After the completion of comprehensive clinical and radiological evaluations and smoking cessation counseling, the course of treatment was discussed thoroughly with the patient, who then gave signed informed consent.

On May 11, 2017, local anesthesia was administered to the patient via facial and palatal infiltration, and the patient underwent oral conscious sedation. An intrasulcular incision was made with a 15-c blade. Atraumatic evulsion of the tooth was performed utilizing gentle intrusion-extrusion forces to create hydraulic pressure inside the alveolus, preserving the socket wall, and minor rotation forces were applied.

Anterior extraction forceps were used for the evulsion of the anterior maxillary right central incisor. The purulence on the facial surface of the extracted tooth is shown in Figure 6.

A universal bone curette was used to meticulously remove granulation tissue, periodontal ligaments and to stimulate bleeding from the bony wall of the socket (Figure 7).

The alveolar bone was inspected, and the topography of alveolar architecture was assessed with visual and tactical



FIGURE 5 Preoperative picture of retracted view. Notice the purulent swelling of the sulcus

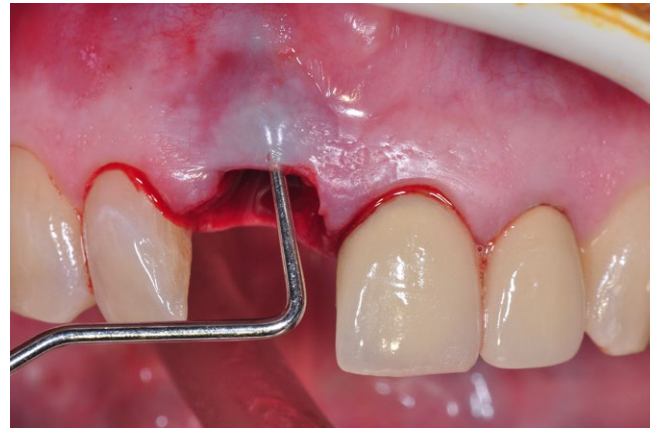


FIGURE 8 Periodontal probe inspection and tactical sensation of the facial plate



FIGURE 6 Evulsion of the tooth. Note the purulence



FIGURE 7 Application of bone curette to recipient bone and tissue bed

sensation by means of periodontal probe (Figure 8). The facial bone plate was determined to have been compromised.

A round diamond bur mounted on a surgical hand piece was used to deepithelialize the sulcular tissue and create a vascular receiving bed for the vascularized pedicle combination epithelial-subepithelialized tissue graft (Figure 9).



FIGURE 9 Surgical rotary with diamond bur

The root planning of adjacent teeth was performed using a back-action chisel and nonwaxed floss to yield a clean root surface adjacent to the receiving bed (Figure 10).

A feather microblade was used to tunnel split thickness of the facial gingiva (Figures 11-14).

An allograft pericardium⁷⁻⁹ (Maxxeus Dental) and a combination of a particulate cortical bone allograft (0.25-1 mm) (OsteoI), cancellous xenograft large granules (1-2 mm) (Straumann Dental) and platelet-rich fibrin (Figures 15 and 16)¹⁰ were prepared.

A traditional protocol for guided bone regeneration was followed.¹¹ To provide a biological chamber similar to that naturally created by the alveolar walls and the pericardium, the clinician, to be judicious and not overfill the gingival wall of the receiving bed and to preserve space for the vascularized pedicle, used combined STG (Figures 17 and 18).

The goals of combining the cortical allograft,¹² xenograft and platelet-rich fibrin were to prevent shrinkage and to improve vascularity and turnover of the bone particles^{10,13-15};



FIGURE 10 Use of chisel to plane the root surface adjacent to the receiving bed



FIGURE 13 The microblade must remain in the same layer during tunneling



FIGURE 11 Microblade was utilized for the split thickness facial tunneling



FIGURE 14 Demonstration of microblade motion



FIGURE 12 Controlled depth of the microblade

however, a meta-analysis proved that some shrinkage is still to be expected.¹⁶

The receiving bed, the facial marginal gingival height zenith and the harvesting side of the hard palate were measured by means of a periodontal probe (Figures 19-21).

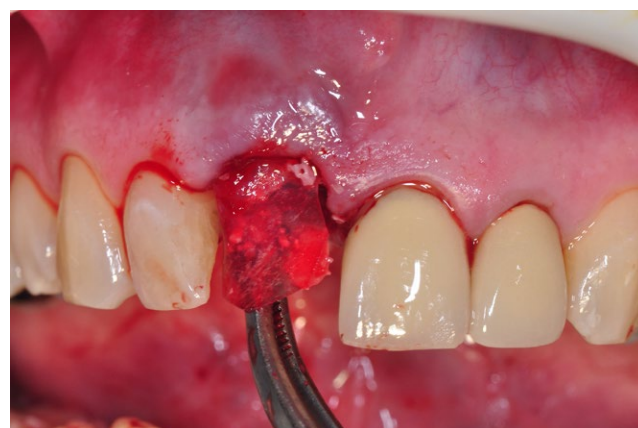


FIGURE 15 Trimmed and positioned pericardium

A new 15-c blade mounted on a rounded handle was used to make a 1-mm-deep incision parallel to the gingival line and two incisions vertical to the first incision. The tissue between the two vertical incisions constituted the epithelial-subepithelial part of the graft (Figure 22).

Outside the two vertical incisions, in the distal and mesial direction, a split thickness incision was performed by means



FIGURE 16 Mixture of allograft, xenograft and platelet-rich fibrin

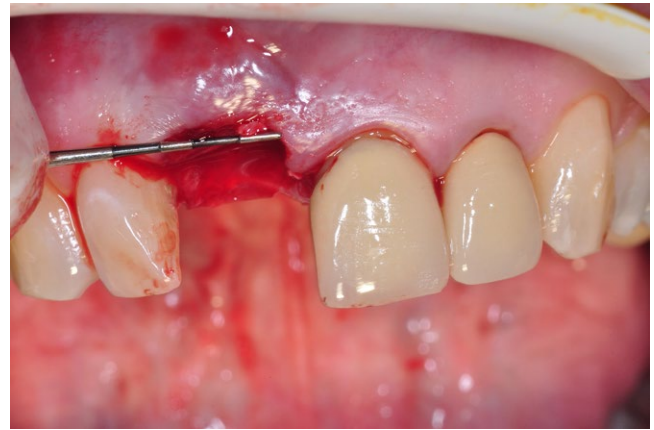


FIGURE 19 Measurement of the width of the receiving bed

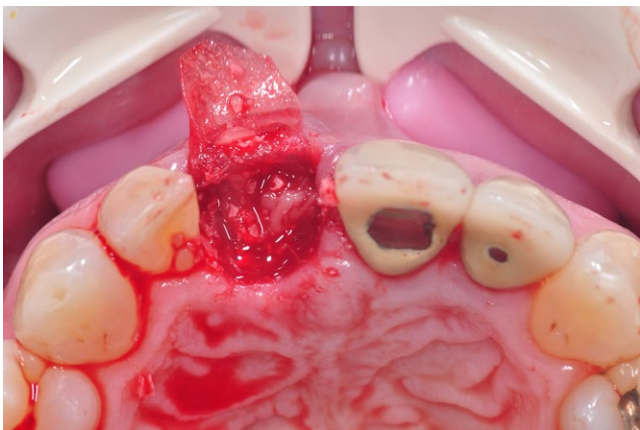


FIGURE 17 The position of the pericardium with respect to the alveolar wall



FIGURE 20 Measurement of the depth of the receiving bed

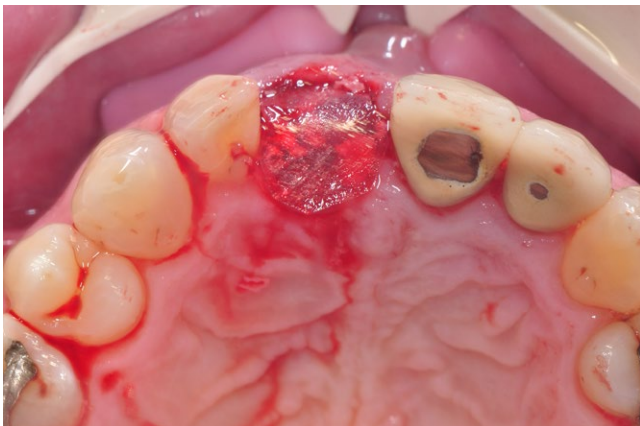


FIGURE 18 The pericardium roof of the created biological chamber

of a traditional method. Care to avoid vascular vital structure is paramount.

Thickness that is both uniform and of a sufficient extent is also important for the success of the procedure and postoperative comfort of the patient.

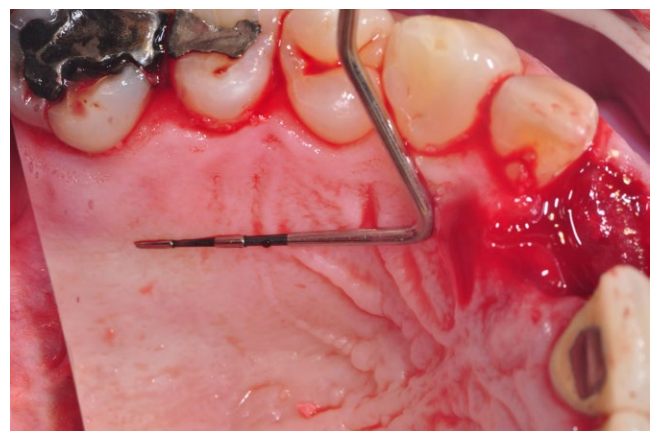


FIGURE 21 Measurement of the harvesting site

In this case, the posterior part of the graft distal to the posterior vertical incision constituted the inlay part of the graft, while the anterior part mesial to the anterior vertical incision constituted the connected and rotated part of the graft.

A basal incision from posterior to anterior was performed with a new blade. This basal cut freed the inlay part, the combination, and the rotated part of the graft. Finally, periosteal



FIGURE 22 Demonstration of the incisions performed



FIGURE 24 The author recommends the subperiosteal elevation of the graft, which results in a more stable graft

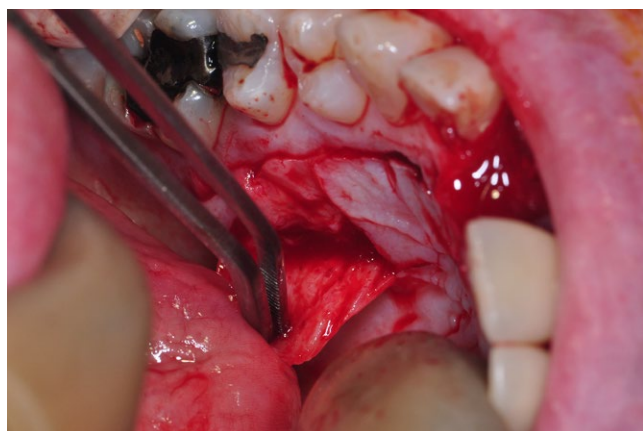


FIGURE 23 Notice that the posterior vertical incision allows the retraction to facilitate the basal incision

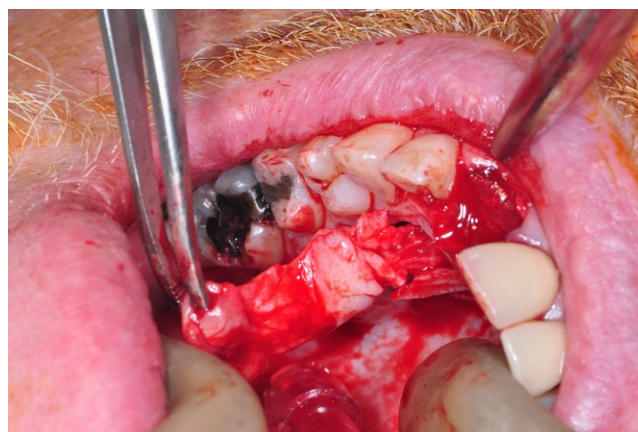


FIGURE 25 Notice the attached rotated, the combination, and the inlay parts of the graft

separation was utilized to completely free the graft, with the exception of the anterior rotated part that required preservation (Figures 23-26).

The complex graft was rotated and checked for the best possible fit (Figure 26). It is important to note that the anterior attached part of the graft leeway is limited before separation; extreme care must therefore be observed to preserve the attached anterior part of the complex graft. A sling suture was used to tunnel the complex graft through the palatal gingival wall. The inlay part of the graft was then tunneled through the prepared tunnel on the facial side of the alveolus (Figures 27-29).

Nontension primary closure was easily achieved by means of 5-0 PTEF sutures (Surgical Esthetics) and 6-0 polypropylene sutures (A-Titan instruments). The palatal incision lips were approximated and protected with a platelet-rich fibrin membrane. The procedure was uneventful. The patient was instructed on an appropriate oral hygiene regimen. A follow-up appointment was scheduled; then, he was dismissed with written care instructions.

3 | RESULTS

Patient outcomes were evaluated on the day following surgery and on June 1, June 12, and July 6, 2017. The patient reported mild discomfort, no bleeding and no alteration in the palatal sensation.

On inspection, the author noticed an extent of sloughing; however, on July 6, 2017, approximately 6 weeks after surgery, complete incorporation and healing were achieved. The author recorded the soft tissue volume, height and quality utilizing a periodontal probe and noted that the volume of soft tissue was sufficient for the soft tissue integration of future dental abutment and fixed prosthetic restoration (Figures 30-35).¹⁷

4 | DISCUSSION

After tooth extraction, the hard and soft tissue architectures require remodeling that results in considerable tissue volume loss.^{11,18}

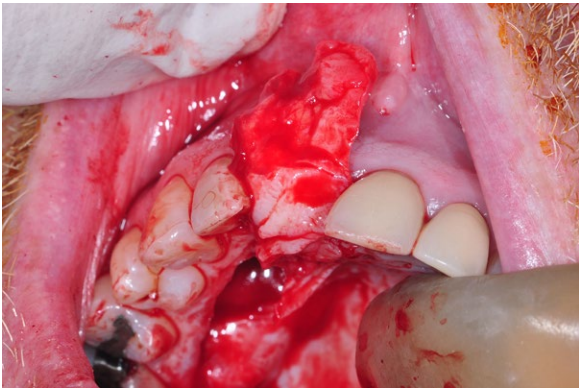


FIGURE 26 The complex graft position to best possible fit

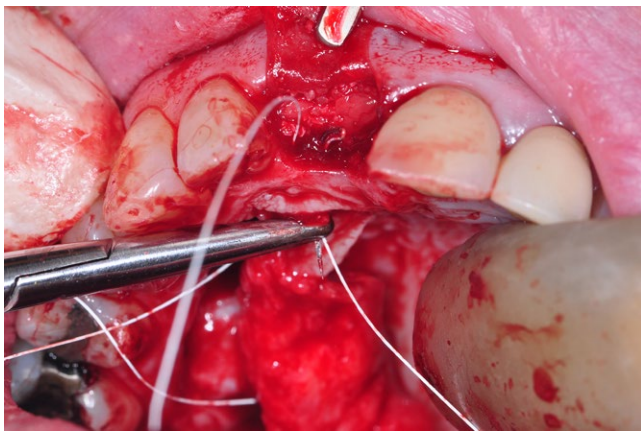


FIGURE 27 The sling suture helped the passage of the complex graft through the palatal gingival tunnel

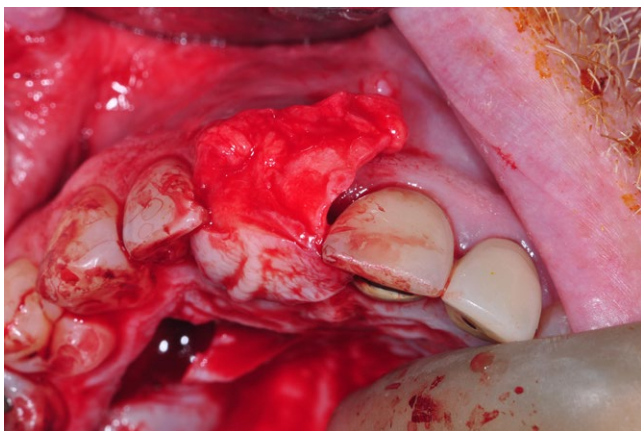


FIGURE 28 The complex graft through the gingival palatal tunnel. The author recommends preservation of 4–5 mm of palatal gingival wall depth

To preserve a natural alveolar ridge architecture, clinicians must seal the soft tissue gap and reform the soft and hard tissue topography; both steps require a high quality and quantity of soft and hard tissue and are traditionally achieved through a socket preservation procedure and soft tissue augmentation. However, some soft tissue recession occurs on maturation,

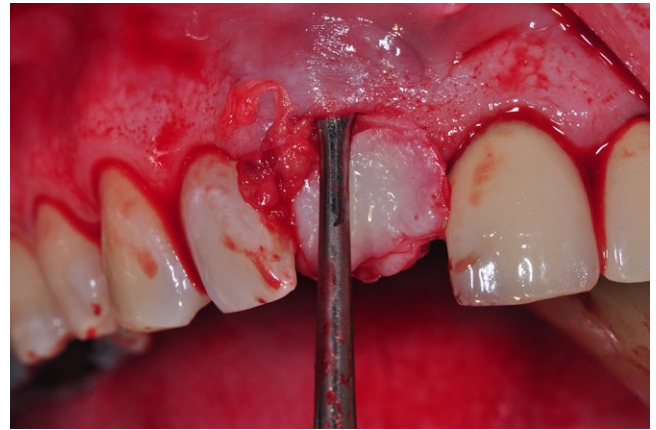


FIGURE 29 Final placement of the complex graft

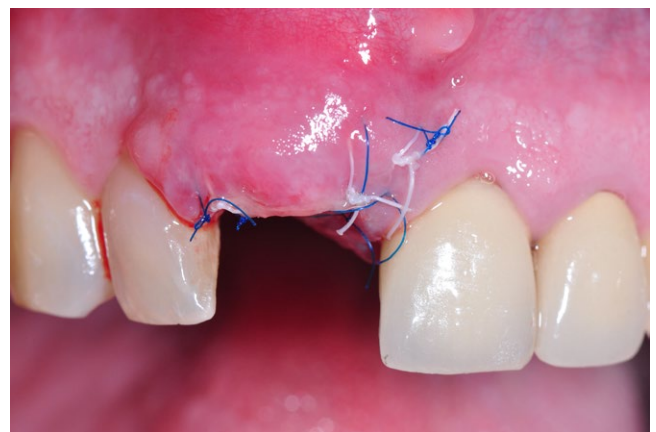


FIGURE 30 Follow-up on June 1, 2017

and different techniques result in different amounts of recession despite the initial promise of results that evidence good healing.¹⁹

For this reason, it is established that the methodology and technique utilized are of utmost importance to achieve natural tissue architecture, especially in the anterior maxilla.²⁰

The challenge of the postextraction tissue gap required a STG to prevent undesirable coronary flap manipulation. Socket seal surgery¹ and other similar techniques can protect the socket architecture, provide more tissue and eliminate the need for flap elevation; however, the limited contact between the grafts and the tissue of the recipient bed on the gingival wall border may reduce the revascularization as well as the survival of the socket seal tissue graft.^{2,21}

Vascularized rotated connective tissue grafts improve the vascularity of the tissue graft,^{4,6,22} the success rate of the procedure, and esthetic outcomes⁴; however, this technique requires surgical expertise. Moreover, anatomic limitations and rotated tissues may affect the procedure by diminishing blood flow through the pedicle tissue graft.³ The author found this technique to provide excellent results with the limitation of

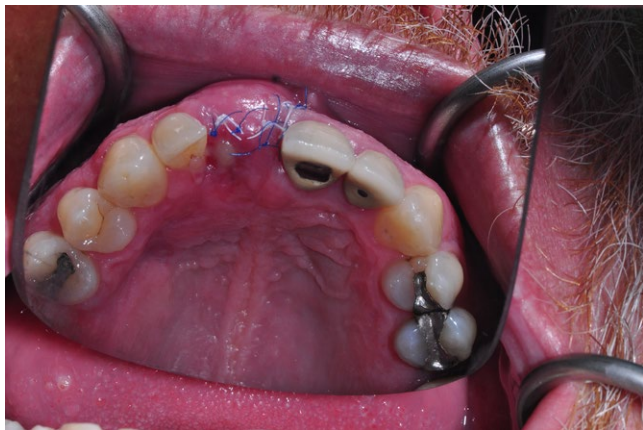


FIGURE 31 Follow-up on June 1, 2017. Notice slight sloughing



FIGURE 34 Follow-up on July 6, 2017

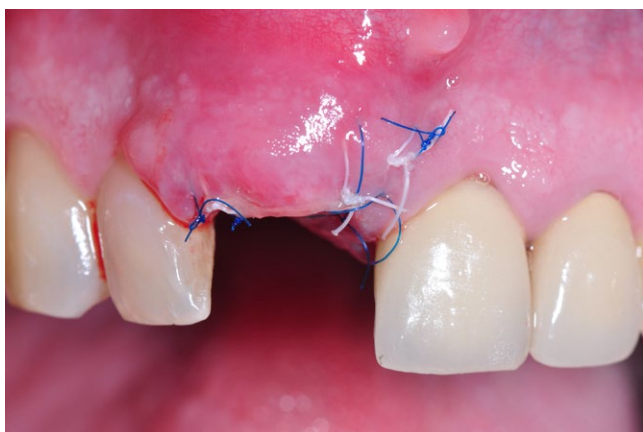


FIGURE 32 Follow-up on June 12, 2017



FIGURE 35 Follow-up on July 6, 2017

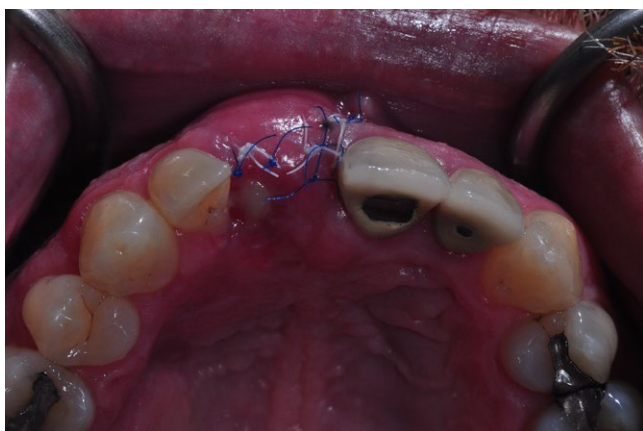


FIGURE 33 Follow-up on June 12, 2017

his clinical practice. This limited observation might be contributed not only to the vascularity of this type of graft but also to the improved stability through the two inlay parts in the palatal and facial ends of the graft design. For the same reason, the combination of the epithelial-subepithelial tissue graft yielded superb results as well.

Moreover, the presented study agrees with that of Stimmelmayer et al,³ that is, the combination inlay portion of the graft is less fragile and ultimately produces a superior vertical dimension of the tissue augmentation, which helps to facilitate soft tissue integration¹⁷ and prevent crystal-bone loss in second-stage surgery.²³

These important factors confirm the preservation of the vascularity, and the utilization of the epithelial-subepithelial combination graft, which was followed by tunneling of the two inlay subepithelial parts of the graft, ultimately achieved the socket seal tissue of the gap with the double thickness epithelial-subepithelial inlay part of the graft. Table 1 shows a comparison of the available surgical techniques.

5 | CONCLUSION

This well-documented case of tissue grafting resulted in primary closure, considerable vertical gingival height and slight displacement of the mucogingival line (Figures 5, 19, 20, 34 and 35).

Even though the results of soft tissue healing were excellent within the limitation of this case report, some sloughing

TABLE 1 Comparison of different surgical techniques

	CT	SSS	RPPCTF	CTG	VPCSTG
Primary closure	Yes	Yes	Yes	Yes	Yes
Provide protection	Yes	Yes	Yes	Yes	Yes
Double thickness	No	Yes	No	Yes	Yes
Vascularized	No	No	Yes	No	Yes
Interposition	No	No	Yes	Yes	Yes

Abbreviations: CT, connective tissue; CTG, combination tissue graft; RPPCTF, rotated pedicle palatal connective tissue flap technique; SSS, socket seal surgery; VPCSTG, vascularized pedicle combined soft tissue graft.

did occur (Figures 31 and 32). The technique may yield more favorable results for nonsmoking patients.

This technique may require advanced surgical expertise and training before utilization. Care must be taken when stabilizing the graft and during the tunneling. The closure should be free of tension.

It is important to preserve the vascularity of the tunneled graft through the greater palatine and sphenopalatine arteries if the graft is attached anteriorly or posteriorly. However, even though vascularity might be compromised from the greater palatine in the anterior maxilla region, the microvasculature through much smaller blood vessels and capillaries that naturally exist in the connective tissue and the periosteum must not be underestimated.²⁴

CONFLICT OF INTEREST

None declared.

AUTHOR CONTRIBUTION

FAR: serve as primary author, inventor of the novel approach, perform the procedure and responsible for skeletal and the construction of the articles. Mania Al Rezk: serve as secondary writer, organizer, literature search and photograph the procedure. Mohanad Al Rezk: serve as secondary author and literature search. RAR: serve as language and scientific structure editing of the manuscript.

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