

TREATMENT OF GINGIVAL RECESSION WITH A MODIFIED "TUNNEL" TECHNIQUE AND AN ACELLULAR DERMAL CONNECTIVE TISSUE ALLOGRAFT

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The treatment of gingival recession through the creation of a "tunnel" beneath the buccal mucosa allows coronal repositioning of the soft tissue with predictable root coverage and aesthetics. Vertical incisions on either side of this tunnel preparation enable placement of a connective tissue graft within the tunnel. The use of an acellular dermal connective tissue allograft permits grafting of multiple sites without the need for a donor tissue surgical site or additional visits. This article demonstrates a modified tunnel technique and a case presentation that incorporates this procedure.

Key Words: allograft, periodontal, flap elevation, tunnel

Numerous surgical techniques have been developed for the correction of gingival recession. Free gingival grafts, sliding pedicle grafts, subepithelial connective tissue grafts, "envelope" or tunnel techniques, guided tissue regeneration, and the use of acellular dermal connective tissue allografts are among the techniques that have been reported.¹⁻¹⁴ As with all procedures, each has advantages and disadvantages. Nevertheless, the ideal soft tissue grafting technique should provide aesthetic, predictable results and allow treatment of one or many teeth. The number of treatment visits should remain low, and the risk of postoperative complications, treatment failure, pain, and bleeding should be minimized.

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This article describes a modified tunnel technique with the use of an acellular dermal connective tissue allograft (AG) (Alloderm, BioHorizons, Birmingham, AL) to achieve root coverage. The tunnel technique has been reported to provide predictable root coverage and enhanced aesthetic results. The modified technique described facilitates simplified placement of the AG and allows multiple and large areas to be treated without involving a donor site or multiple visits.

Surgical Procedure

Incisions and Recipient Bed Preparation

The purpose of tissue elevation is to provide a freely movable gingival flap that will allow placement of a soft tissue graft beneath the flap and facilitate complete root coverage (Figure 1). Maintenance of the physical integrity of the interdental papillae and a wide flap base ensures proper blood flow and healing. Initial incisions are placed into the gingival sulcus and followed by additional



Figure 1. Preoperative view demonstrates the presence of generalized mild to moderate gingival recession on teeth #6(13) through #8(11).

incisions performed with an Orban knife (Hu-Friedy, Chicago, IL). The flap is subsequently elevated with this instrument. Care must be taken not to cut or perforate the flap or interdental papillae in order to maintain the blood flow and facilitate healing. Elevation of the full-thickness gingival flap should continue until the attached keratinized gingiva is completely free. The incision should then be extended into the elastic mucosa to allow freedom of movement during flap repositioning.

Following flap elevation, vertical incisions should be placed mesial and distal to the teeth being treated. The incisions should begin in the center of the interdental papillae and continue into the buccal mucosa. The entire papillae are not included in order to minimize resultant gingival recession on an untreated tooth. The angle of the vertical incisions should cause the apical base of the flap to be wider than the incisal portion in order to ensure sufficient blood supply to the gingival flap. A periosteal elevator should subsequently be inserted through the tunnel created between the vertical incisions (Figure 2). The tunnel must be large enough and free of tissue tags to allow easy placement of the graft material. The gingival flap is then repositioned to demonstrate that complete root coverage can be achieved. Minimal tension should exist on the gingival flap during repositioning. Limitations in the tunnel preparation that may prevent graft placement or repositioning must be identified and eliminated. Final preparation of the recipient bed involves treatment of the teeth and their root



Figure 2. A periosteal elevator was carefully utilized to raise a buccal flap and maintain the interdental papillae.



Figure 3. The acellular dermal connective tissue allograft was placed beneath the gingival flap.

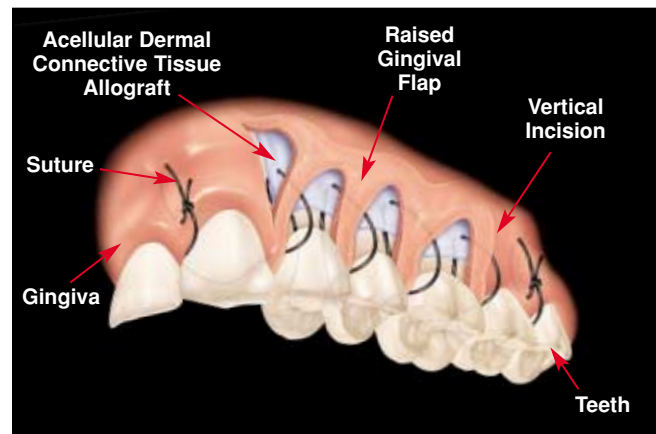


Figure 4. Illustration demonstrates the suturing technique utilized for placement of the acellular dermal connective tissue allograft. Note position of sutures in relation to flap and graft.

surfaces. Full access to the root surfaces is limited, however, due to the impossibility of fully reflecting the gingival flap.

Preparation of Donor Tissue and Graft Placement

The acellular dermal connective tissue allograft (AG) must be rehydrated in saline for approximately 5 to 10 minutes and trimmed to size prior to placement. The AG has a thickness of approximately 1 mm to 1.5 mm, and the length of the graft is determined by the size of the site to be treated. A width of 5 mm is generally adequate. Since the AG has a more resilient consistency than connective tissue retrieved from the palate, a sharp surgical blade must be used for trimming. It should be noted that



Figure 5. The gingival flap was repositioned over the allograft in the coronal position and secured with plain gut sutures.



Figure 6. Postoperative view 1 week following treatment indicated successful healing. Many of the sutures were resorbed or had fallen out.

the AG has a thin basement membrane on one side; this nonpermeable membrane can be utilized as a barrier. The connective tissue and basement membrane sides can be differentiated by placing blood on either side of the AG. The connective tissue side will present a rough appearance, whereas the basement membrane side will appear smooth.

The use of vertical incisions for flap elevation simplifies placement of the AG through the tunnel with an Orban knife, a periosteal elevator, or cotton pliers (Figure 3). Utilization of a suture is not necessary to pull the AG through the opening. The connective tissue surface of the AG is placed adjacent to the gingival flap in order to maximize blood supply.

Suturing

Utilization of a continuous 5.0 plain gut suture is recommended in order to secure the AG (Figure 4). The suture is initially fastened to an area distal to the surgical site and is subsequently passed interproximally around the lingual aspect of the teeth. It is then run interproximally to engage the AG on the buccal aspect. This procedure is repeated until the AG is secured to the recipient bed. It should be noted that the AG is positioned coronal to the buccogingival margin, where the intact interdental papillae prevent the graft from being shifted coronally. The final suture knot is tied in a mesial position distant from the surgical site to prevent it from impeding the healing of the root surfaces.

A second suture is used to position the gingival flap coronally over the graft and root surface, and it is tied in the same manner as the first, using 4.0 or 5.0 plain surgical gut (Figure 5). Utilization of a vertical mattress technique facilitates complete root and graft coverage when the buccal mucosa is engaged. Continuous or interrupted 5.0 plain gut sutures are used to secure each vertical incision. When completed, the AG and root surfaces should be completely covered by the gingival flap. Minimal tension should exist on the gingival flap, and a periodontal dressing is not required.

Postoperative Instructions

A cold compress should be placed extraorally for 10-minute intervals to minimize swelling. If bleeding occurs,



Figure 7. Postoperative view 10 weeks following treatment demonstrates significant root coverage and a normal appearance of the interdental papillae.

pressure should be applied with a moist sterile gauze for 15 to 20 minutes. If this does not control the bleeding, the clinician should be contacted immediately. The patient is instructed not to brush the surgical site for a minimum of 2 weeks following the procedure. A 0.12% chlorhexidine rinse is prescribed, and the patient is instructed to rinse twice daily for 30 seconds during this period. Gentle brushing can be resumed with a soft bristle toothbrush following observation of the healing period (a minimum of 4 weeks). Utilization of dental floss is not permitted. Since the plain surgical gut sutures will resorb and fall loose on their own, the patient is instructed to cut the loose ends rather than pull them out (Figure 6). While pain control is accomplished primarily with use of the nonsteroidal anti-inflammatory drugs, narcotic medications may be required for acute pain during the final healing period (Figure 7).

Case Presentation

A 39-year-old nonsmoking male patient presented with a noncontributory medical history and mild to moderate gingival recession on teeth #11(23) through #13(25) (Figure 8). An acellular dermal connective tissue graft was placed according to the aforementioned surgical protocol following flap elevation (Figures 9 and 10). Plain gut sutures were used to secure the gingival flap over the AG without surgical dressing (Figure 11). Postoperative hygiene instructions were explained and amoxicillin (500 mg) was prescribed for 1 week. Follow-up evaluation 1 week postoperatively revealed that the surgical sites healed well. Most of the sutures were resorbed or had fallen out. The patient was advised to commence gentle brushing without dental flossing for the next 4 to 6 weeks. Minimal residual gingival recession was evident 10 weeks postoperatively. Healing was uneventful, and treatment resulted in increased root coverage, reduced gingival recessions, and enhanced aesthetics of the interdental papillae and surrounding tissues (Figures 12 and 13).

Discussion

In an effort to cover exposed root surfaces and increase the zone of attached keratinized gingiva, a number of soft tissue grafting procedures have been developed.¹⁻¹⁴ While subepithelial connective tissue grafts have been



Figure 8. Case 2. Preoperative view of teeth #11(23) through #13(25). Note the presence of mild to moderate gingival recession and varying amounts of attached keratinized soft tissue.



Figure 9. Vertical incisions were made in the gingival sulcus that extended from the middle of the papillae adjacent to the treatment side apically into the mucosa.



Figure 10. Buccal view following placement of the acellular dermal connective tissue allograft beneath the gingival flap.

proven to be effective,^{5,6} a defect in or near the interdental papillae is often found postoperatively following elevation of an envelope gingival flap. This defect is viewed as a horizontal groove through the papillae or a reduction in its size and may not be correctable.¹⁵



Figure 11. Plain gut sutures were utilized to secure the gingival flap over the allograft in the coronal position. Surgical dressing was not required.



Figure 12. Postoperative buccal view 1 week following treatment demonstrates resorbed or lost sutures and uneventful healing.



Figure 13. Postoperative view 8 weeks following treatment indicated little gingival recession, increased root coverage, and enhanced aesthetics of the interdental papillae and surrounding tissues.

Utilization of a tunnel technique maintains the integrity of the gingival interdental papillae, facilitates healing, and provides highly aesthetic results.^{10,16,17} Since the gingival flap must be elevated through the space provided by the gingival sulcus without tearing either the

flap or the papillae, it must be released by incisions into the elastic mucosa, and a tunnel that is free of interferences must be prepared. The connective tissue graft must be positioned in the small tunnel provided by the gingival sulcus. Access to the gingival flap is facilitated by the utilization of vertical incisions, and the incidence of accidental tears in the gingival flap is decreased.

Traditional tunnel techniques have been regarded as technique-sensitive and time-consuming.¹⁰ The vertical incisions allow direct placement of the graft into the tunnel preparation. Traditional placement through the gingival sulcus requires placement of a suture to pull the graft through the tunnel. Vertical incisions also facilitate the detection of tissue tags that may disrupt the continuity of the tunnel preparation and complicate the positioning of the graft.

The use of an acellular dermal connective tissue allograft has been described in the literature.^{12,13} Root coverage and aesthetic enhancement following AG placement is comparable to therapy that incorporates connective tissue harvested from the patients' palates.¹³ The use of an AG eliminates the need for a donor tissue surgical site that may result in complications (eg, bleeding and postoperative pain), particularly in large grafting cases.^{18,19} The size, shape, and quality of the AG is standardized, and the material is available in a variety of lengths and heights (standard width = 1 mm to 1.5 mm). Unlike connective tissue retrieved from the palate, AG does not have fatty tissue or epithelium that must be removed. The final shape of the AG can be determined by the surgeon following tissue shaping on the surgical tray. In addition, the AG has a tough and even consistency that facilitates tissue positioning through the tunnel preparation.

Conclusion

The modified tunnel technique with the use of an acellular dermal connective tissue allograft material combines several techniques that maximize their benefits. Root coverage was facilitated by the technique described, and utilization of the AG allowed coverage of multiple and large areas without incorporation of a donor site or multiple visits. Based on these reports, placement of an AG with the modified tunnel technique is an effective

treatment modality for one or many teeth, with predictable and highly aesthetic results.

Acknowledgment

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CONTINUING EDUCATION (CE) EXERCISE No. 3

To submit your CE Exercise answers, please use the answer sheet found within the CE Editorial Section of this issue and complete as follows: 1) Identify the article; 2) Place an X in the appropriate box for each question of each exercise; 3) Clip answer sheet from the page and mail it to the CE Department at Montage Media Corporation. For further instructions, please refer to the CE Editorial Section.

The 10 multiple-choice Continuing Education (CE) questions for this exercise are based on the article "Treatment of gingival recession with a modified 'tunnel' technique and an acellular dermal connective tissue allograft" by Douglas H. Mahn, DDS. This article is on Pages 69-74.

Learning Objectives:

This article documents the treatment of gingival recession using a modified tunnel technique and an acellular dermal connective tissue allograft. Upon reading this article and completing this exercise, the reader should:

- Have an increased awareness of the modified tunnel technique utilized to raise a gingival flap.
- Understand the uses of an acellular dermal connective tissue allograft in treating gingival recession.

1. Which surgical technique has been used for the treatment of gingival recession?

- Sliding pedicle grafts.
- Free gingival grafts.
- Subepithelial connective tissue grafts.
- All of the above.

2. Which characteristic should a successful grafting technique provide?

- Aesthetic results.
- Predictable results.
- Minimal complications.
- All of the above.

3. What feature distinguishes the utilization of vertical incisions for allograft placement from traditional tunnel techniques?

- Full-thickness gingival flap.
- Split-thickness gingival flap.
- The mobility of the gingival flap.
- A suture is not required to pull the graft through the tunnel.

4. Utilization of the vertical incision technique facilitates:

- Detection of tissue tags.
- Graft positioning.
- Placement of the graft into the tunnel preparation.
- All of the above.

5. The thickness of the acellular dermal connective tissue allograft used is:

- 0.5 mm to 1 mm.
- 1 mm to 1.5 mm.
- 1.5 mm to 2 mm.
- 2 mm to 2.5 mm.

6. What precaution must be taken prior to placement of the acellular dermal connective tissue allograft?

- The material must be rehydrated in saline for approximately 5 to 10 minutes.
- The material must be tenderized with a small amalgam condenser.
- The material must be dehydrated under a bright light for 5 to 10 minutes.
- The material must be placed without altering the original shape of the allograft.

7. The smooth side of the acellular dermal connective tissue allograft represents:

- The basement membrane side.
- The connective tissue side.
- The epithelial side.
- The more processed side.

8. The connective tissue side of the acellular dermal connective tissue allograft should be placed so that it is:

- Against the root surface.
- Against the bone.
- Exposed above the gingival flap.
- Adjacent to the inner surface of the gingival flap.

9. Prior to graft placement, root eminences should be:

- Flattened.
- Scaled and root planed.
- Both a and b.
- None of the above.

10. To ensure connective tissue graft survival, a periodontal dressing:

- Should be placed for 1 week.
- Should be placed for 2 weeks.
- Should be tightly secured using dental floss.
- From clinical experience, may not be necessary.