
Correcting Gingival

Application of Tunnel Techniques
and Acellular Dermal Matrices

Douglas H. Mahn, DDS

ADMs have been highly successful in the treatment of gingival recession and allow for the treatment of multiple teeth in a single visit.

Abstract

The soft tissue architecture is an important part of an attractive smile. Autogenous connective grafts have been successful in treating gingival recession. Their availability, however, is limited by palatal anatomy. Acellular dermal matrices have been shown to be successful in the treatment of gingival recession and do not have availability problems. Traditional flap elevation can lead to shrinkage of the interdental papillae and diminish esthetic results. Tunnel techniques protect the interdental papillae. This article discusses the use of an acellular dermal allograft and a tunnel technique in the treatment of multiple gingival recession sites in the esthetic zone.

Key Words: gingival recession, connective tissue graft, acellular dermal matrix, tunnel technique

Recession

Introduction

Gingival recession represents a challenge in the development of an attractive smile. Proper tooth size and proportion is dependent upon the soft tissue architecture.¹ Covering root surfaces, however, must not be the only goal in corrective techniques. Such techniques should consider protection of the interdental papillae and avoid the complication of blunted interdental papillae.

The subepithelial connective tissue graft (CTG) was first described as a method to enhance anterior cosmetics.² An “envelope” technique was developed to achieve root coverage on a single tooth without the problems associated with vertical incisions.³ Tunnel grafting techniques, which protect the interdental papillae, improved the esthetic results of connective tissue grafting for multiple recession sites.⁴⁻⁹

The number of teeth to be treated using CTGs is limited by the amount of tissue that can be harvested from the patient’s palate.^{10,11} An acellular dermal matrix (ADM) does not have this drawback because it is derived from human donor skin.¹²⁻¹⁴ ADMs have been highly successful in the treatment of gingival recession and allow for the treatment of multiple teeth in a single visit.¹⁵⁻²² An ADM’s uniform thickness makes it ideal for use with a tunnel technique.^{16-18,21,22}

Case 1

A 36-year-old nonsmoking female reported the chief complaint of an “ugly smile” caused by gingival recession (Fig 1). Teeth ##5-12 were found to have 1 to 4 mm of gingival recession (Fig 2). After discussing the findings, treatment plan options, and risks with the patient, the author agreed to treat these teeth with connective tissue grafting.

Profound local anesthesia was achieved using 2% lidocaine with 1:100,000 epinephrine. Intrasulcular incisions were made along the facial surfaces of ##4-13 using a Bard-Parker (Becton Dickinson; Franklin Lakes, NJ) #15 blade (Fig 3). Only in the areas between #5 and #6, and #11 and #12 were incisions made in the facial interdental papillae. Leaving the interdental papillae intact from ##6-11, a full thickness flap was raised using an Orban knife (Hu-Friedy; Chicago, IL). Individual pouches were created adjacent to each tooth. These pouches were extended beneath the mucogingival tissues until a continuous tunnel extended from #5 to #12. The flaps were dissected into the mucosa until each flap was freely mobile and could be passively positioned over the root surfaces. Root planing using curettes was performed to reduce root prominences and smooth root surfaces.

An ADM (AlloDerm, BioHorizons; Birmingham, AL) was trimmed to approximately 5 mm in height and 40 mm in length (Fig 4). Using the Orban knife, the ADM was inserted into the mucogingival tunnel between #5 and #6. It was pushed and pulled through the tunnel until the roots of ##5-12 were covered. The ADM was secured using a continuous 4.0 plain gut suture (Fig 5). The gingiva was then coronally advanced over the root surfaces, including the ADM, and secured with a continuous 4.0 chromic gut suture (Fig 6).

Postoperative discomfort was controlled using ibuprofen (600 mg, every six to eight hours) as needed. The patient was prescribed amoxicillin (875 mg, every 12 hours) for 10 days. She was instructed to rinse twice daily with 0.12% chlorhexidine gluconate (Peridex, Proctor & Gamble; Cincinnati, OH), and told not to brush or floss the area for seven days.

After one week, the surgical site was healing well (Fig 7). The remaining sutures were removed. The patient was directed to discontinue the rinse and to begin gentle brushing and flossing.

After 12 weeks, the treatment sites were found to have healed well, with complete root coverage and improved gingival contours observed (Fig 8). No interdental papillae were noted. The patient reported being very happy with the overall improvement in her smile (Fig 9).



Figure 1: A pretreatment view shows how gingival recession detracts from the appearance of the patient's smile.



Figure 2: A pretreatment clinical view of ##5-12 demonstrates mild to severe gingival recession.



Figure 3: Intrasulcular incisions were carefully made buccally to ##5-12. Care was taken not to traumatize the interdental papillae.

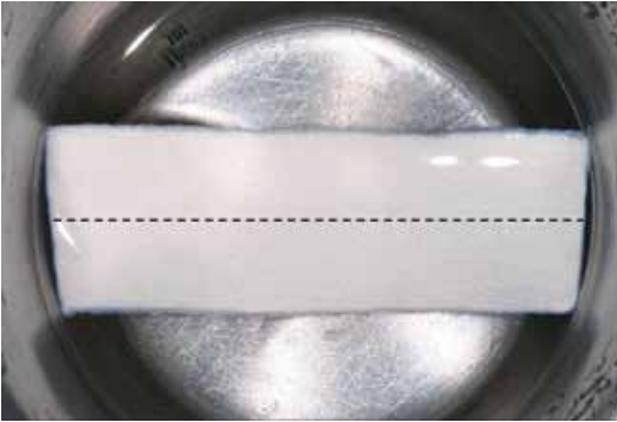


Figure 4: The ADM is rehydrated in sterile saline. The broken line indicates where the matrix was trimmed to the desired dimensions.



Figure 5: The ADM has been placed within the tunnel. The bloodstained matrix can be visualized below the gingival margin.



Figure 6: The gingival flap has been coronally advanced completely over the graft and the roots. A continuous 4.0 chromic gut suture secures its position.



Figure 7: At the one-week follow-up visit, the surgical site is found to be healing well.



Figure 8: At 12 weeks, the surgical site has healed well, with complete root coverage and a healthy appearance.



Figure 9: The improved soft tissue architecture greatly enhances the smile's attractiveness.

Cases 2 and 3

Cases 2 and 3 are very similar to Case 1. Both patients were nonsmoking females whose chief complaints were gingival recession in the esthetic zone. Tunnels were created beneath the mucogingival tissues from #6 to #11. The composite on #8 in Case 3 was removed using a football-shaped diamond bur, and the root was hand-curetted smooth. The ADM was placed within the tunnel and secured using a continuous 4.0 plain gut suture. A continuous 4.0 chromic gut suture was used to secure the mucogingival flap completely over the ADM and root surfaces. After 12 weeks, all sites were found to have healed well, with little to no residual recession and a natural appearance (Figs 10-13).



Figure 10: A pretreatment view of Case 2 shows the gingival recession.



Figure 11: A post-treatment view of Case 2 shows the correction of the gingival recession.



Figure 12: A pretreatment view of Case 3 shows the gingival recession. Tooth 8 has a cervical resin restoration.



Figure 13: A post-treatment view of Case 3 shows the correction of the gingival recession and esthetic improvement.

Discussion

The treatment of gingival recession using CTGs is well documented.²⁻⁹ A palatal donor site, however, limits the amount of tissue to be used.^{10,11} This can impede the treatment of multiple teeth in a single appointment. In addition, postoperative discomfort has been associated with the palatal donor site.^{23,24}

ADMs are derived from the skin of human donors.¹²⁻¹⁴ Their cellular component is removed while maintaining their ultrastructural acellular matrix. ADMs are cut into pieces, having a uniform thickness between 0.89-1.65 mm. The undamaged collagen and elastin matrices do not initiate an inflammatory response in the recipient site. Cellular repopulation and revascularization of the ADM occurs through preserved vascular channels.^{13,14,16,25} For the ADM to revascularize, it must be in direct contact with vital tissue. The ADM must be completely covered by the gingival flap for it to survive.^{13,14,20,21}

ADMs have been documented to have been successful in the treatment of gingival recession.^{15,16,20,21} Not being limited by palatal anatomy, ADMs are useful in the treatment of multiple sites in a single visit.^{15,19,22} In addition, its uniform dimensions make an ADM ideal for use with tunnel techniques.^{17,18,21,22}

Choice of surgical design and technique is an important consideration in cosmetic root coverage treatment.²⁶ Despite an apicocoronal direction of blood perfusion of the anterior gingiva, circulation is compromised where incisions are made.^{27,28} By protecting the interdental papillae from incisions, tunnel techniques promote esthetic outcomes.

Creating access to the mucogingival tunnel can be done using different methods. Using the space provided adjacent to an individual tooth is one way.³⁻⁵ Limited space, however, can make this difficult. The gingival margin tears, and damage to the interdental papillae is a concern.

Vertical incisions have been used to create access to the mucogingival tunnel. In one technique, vertical incisions are made on both sides of the tunnel.^{16,17} In another technique, a vertical incision is made in a central site of the tunnel.¹⁸ The vertical incision can create a wide opening that greatly facilitates graft placement. After the graft is placed and the gingiva is secured over the graft and root surfaces, the vertical incisions are then sutured closed.

Finally, the gingival flap can be detached from the interdental papillae at isolated sites that are not esthetically critical.^{7,22} This is typically at a site distal to the treatment area. While not creating an opening as wide as a vertical incision permits, it will facilitate placement of a large graft. The detached area is sutured into position following graft placement. This method was chosen for all three cases described because it was deemed the least invasive and yet adequate for proper graft placement.

Summary

Correction of gingival recession can improve a patient's smile. Multiple gingival recession defects in the esthetic zone can be treated successfully using mucogingival tunnel techniques and acellular dermal matrices.

Choice of surgical design and technique is an important consideration in cosmetic root coverage treatment.

References

- Ohyma H, Nagai S, Tokutomi H, Ferguson M. Recreating an esthetic smile: a multidisciplinary approach. *Int J Periodontics Restorative Dent*. 2007;27(1):61-9.
- Langer B, Calagna L. The subepithelial connective tissue graft: a new approach to the enhancement of anterior cosmetics. *Int J Periodontics Restorative Dent*. 1982;2(2):22-33.
- Raetzke PB. Covering localized areas of root exposure employing the "envelope" technique. *J Periodontol*. 1985 Jul;56(7):397-402.
- Allen AL. Use of a supraperiosteal envelope in soft tissue grafting for root coverage. I. rationale and technique. *Int J Periodontics Restorative Dent*. 1994 Jun;14(3):216-27.
- Allen AL. Use of a supraperiosteal envelope in soft tissue grafting for root coverage. II. clinical results. *Int J Periodontics Restorative Dent*. 1994 Aug;14(4):302-15.
- Zaballegui I, Sicilia A, Cambro J, Gil J, Sanz M. Treatment of multiple adjacent gingival recessions with the tunnel subepithelial connective tissue graft: a clinical report. *Int J Periodontics Restorative Dent*. 1999 Apr;19(2):199-206.
- Zuchelli G, Amore C, Sforza NM, Montebugnoli L, DeSanctis M. Bilaminar techniques for the treatment of recession-type defects: a comparative clinical study. *J Clin Periodontol*. 2003 Oct;30(10):862-70.
- Vergara JA, Caffesse RG. Localized gingival recessions treated with the original envelope technique: a report of 50 consecutive patients. *J Periodontol*. 2004 Oct;75(10):1397-403.
- Ribeiro FS, Zandim DL, Pontes AEF, Mantovani RV, Sampaio JEC, Marcantonio Jr. E. Tunnel technique with a surgical maneuver to increase the graft extension: case report with a 3-year follow-up. *J Periodontol* 2008 Apr;79(4):753-8.
- Studor SP, Allen EP, Rees TC, Kouba A. The thickness of masticatory mucosa in the human hard palate and tuberosity as potential donor sites for ridge augmentation procedures. *J Periodontol*. 1997 Feb;68(2):145-51.
- Monnet-Corti V, Santini A, Glise JM, Fouque-Deruelle D, Dillier F-L, Liébart M-F, Borghetti A. Connective tissue graft for gingival recession treatment: assessment of the maximum graft dimensions at the palatal vault as a donor site. *J Periodontol*. 2006 May;77(5):899-902.
- Wainwright D, Madden M, Luteran A, Hunt J, Monafó W, Heimbach D, Kagan R, Sittig K, Dimick A, Herndon D. Clinical evaluation of an acellular allograft dermal matrix in full-thickness burns. *J Burn Care Rehabil*. 1996 Mar-Apr;17(2):124-6.
- Rhee PH, Friedman CD, Ridge JA, Kusiak J. The use of processed allograft dermal matrix for intraoral resurfacing: an alternative to split-thickness skin grafts. *Arch Otolaryngol Head Neck Surg*. 1998 Nov;124(11):1201-4.
- Livesey S, Herndon D, Hollyoak M, Atkinson Y, Nag A. Transplanted acellular allograft dermal matrix. *Transplantation*. 1995;60:1-9.

15. Aichelmann-Reidy ME, Yukna RA, Evans GH, Nasr HF, Mayer ET. Clinical evaluation of acellular allograft dermis for the treatment of human gingival recession. *J Periodontol*. 2001 Aug;72(8):998-1005.
16. Mahn DH. Treatment of gingival recession with a modified "tunnel" technique and an acellular dermal connective tissue allograft. *Pract Procd Aesthet Dent*. 2001 Jan-Feb;13(1):69-74.
17. Mahn DH. Esthetic correction of gingival recession using a modified tunnel technique and an acellular dermal connective tissue allograft. *J Esthet Rest Dent*. 2002;14(1):18-23.
18. Zadeh HH. Minimally invasive treatment of maxillary anterior gingival recession defects by vestibular incision subperiosteal tunnel access and platelet-derived growth factor BB. *Int J Periodontics Restorative Dent*. 2011 Nov-Dec;31(6):653-60.
19. Mahn DH. The treatment of multiple sites of gingival recession in a single visit using an acellular dermal connective tissue allograft: a case report. *VA Dent J*. 2002;79(1):7-10.
20. Felipe MEMC, Andrade PF, Grisi MFM, Souza SLS, Taba M Jr., Paliano DB, Novaes AB Jr. Comparison of two surgical procedures for the use of the acellular dermal matrix graft in the treatment of gingival recessions: a randomized controlled clinical study. *J Periodontol*. 2007 Jul;78(7):1209-17.
21. Papageorgakopoulos G, Greenwell H, Hill M, Vidal R, Scheetz JP. Root coverage using acellular dermal matrix and comparing a coronally positioned tunnel to a coronally positioned flap approach. *J Periodontol*. 2008 Jun;79(6):1022-30.
22. Mahn DH. The use of the tunnel technique and an acellular dermal matrix in the treatment of multiple adjacent teeth with gingival recession in the esthetic zone. *Int J Periodontics Restorative Dent*. 2010 Dec;30(6):593-9.
23. Del Pizzo M, Modica F, Bethaz N, Priotto P, Romagnoli R. The connective tissue graft: a comparative clinical evaluation of wound healing at the palatal donor site. A preliminary study. *J Clin Periodontol*. 2002 Sep;29(9):848-54.
24. Griffin TJ, Cheung WS, Zavras AI, Damoulis PD. Postoperative complications following gingival augmentation procedures. *J Periodontol*. 2006 Dec;77(12):2070-90.
25. Henderson RD, Greenwell H, Drisko C, Regennitter FJ, Lamb JW, Mehlbauer MJ, Goldsmith LJ, Rebitski G. Predictable multiple site root coverage using an acellular dermal matrix allograft. *J Periodontol*. 2001 May;72(5):571-82.
26. Pini-Prato G, Cairo F, Rotundo R, Franceschi D. Esthetic evaluation of root coverage outcomes: a case series study. *Int J Periodontics Restorative Dent*. 2011 Nov-Dec;31(6):601-10.
27. Mormann W, Ciancio SG. Blood supply of human gingival following periodontal surgery: a fluorescein angiographic study. *J Periodontol*. 1977 Nov;48(11):681-92.
28. Mörmann W, Meier C, Firestone A. Gingival blood circulation after experimental wounds in man. *J Clin Periodontol*. 1979 Dec;6(6):417-24. **JCD**

Multiple gingival recession defects in the esthetic zone can be treated successfully using mucogingival tunnel techniques and acellular dermal matrices.



Dr. Mahn owns a private practice in Manassas, Virginia.

Disclosure: The author did not report any disclosures.