

# Peri-Implant Keratinized Tissue Width Enhancement Using Allogeneous Soft Tissue Graft Material: A Case Report

Mahdi Kadkhodazadeh<sup>1</sup>  | Seyed Sepehr Mirebeigi-Jamasbi<sup>2</sup>  | Reza Amid<sup>1</sup>  | Seyedeh Zahra Mirsharif<sup>2\*</sup> 

1. Department of Periodontics, School of Dentistry, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

2. Research Committee, School of Dentistry, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

## Article Info

Received: 21 November, 2024

Accepted: 22 December, 2024

Published: 29 December, 2024

## \*Corresponding Author

Seyedeh Zahra Mirsharif, Research Committee, School of Dentistry, Shahid Beheshti University of Medical Sciences, Tehran, Iran.

Email: mirsharifatie@gmail.com

## Abstract

Various surgical techniques have been developed to reconstruct keratinized tissue (KT) around dental implants, including the use of acellular dermal matrix (ADM). However, ADM grafting is commonly performed with a partial-thickness flap, which can be technique-sensitive and may lead to flap thinning or perforation.

In this case, a 54-year-old male presented with discomfort and hygiene issues around mandibular implants placed 10 months prior. Clinical examination revealed a thin gingival biotype, inadequate KT, and shallow vestibules in the area from the mandibular left canine to the first molar. To address these challenges, we opted for a modified approach using an apically positioned full-thickness flap combined with a 7 mm wide ADM graft, eliminating the need for a donor site and improving structural stability.

At the nine-month follow-up, results showed a 4-5 mm increase in KT, enhanced vestibular depth, and favorable esthetics with satisfactory color matching. This technique provided both functional stability and esthetic satisfaction, making ADM grafting with a full-thickness flap a reliable option for KT reconstruction in esthetic zones.

**Keywords:** Soft tissue; Allogenic grafting; Keratinized tissue; Dental implants; Oral cavity.

## Please cite this paper as:

Kadkhodazadeh M, Mirebeigi-Jamasbi SS, Amid R, Mirsharif SZ. Peri-Implant keratinized Tissue Width Enhancement Using Allogeneous Soft Tissue Grafting Material: A Case Report. Journal of "Regeneration, Reconstruction & Restoration" (Triple R). 2024; Volume 9: e20. Doi: 10.22037/rrr.v9.46801

## 1. Introduction

An insufficient amount of attached keratinized tissue (KT) has been associated with increased bleeding on probing, plaque accumulation, compromised esthetics, gingival inflammation (1,2) and may contribute to peri-implantitis and greater mucosal soft tissue recession (3-5). Several studies have explicitly stated that a minimum of 2 mm of KT on the buccal surface is essential for achieving better long-term outcomes following implantation(6,7). In cases where less than 2 mm of KT is present around the implant, grafting may be required.

Various surgical techniques have been developed to reconstruct KT around dental implants, including apically positioned flaps (APFs), pedicle grafts, and free gingival grafts (FGG) (8,9). The free gingival graft has long been

considered the gold standard for increasing both the width and thickness of KT, as well as enhancing vestibular depth. Although the FGG method is effective, it requires a donor site, which can increase morbidity and the risk of surgical complications (10).

Studies have demonstrated that acellular dermal matrix (ADM) grafts offer a viable alternative for increasing KT around implants while eliminating the need for a donor site (11,12). Although some reports suggest that ADM provides less KT compared to FGG, it yields a clinically sufficient amount of KT, and offers superior esthetic results compared to FGG (13).

A common method for ADM grafting is using a partial-thickness flap at the recipient site(10). Some studies indicate that partial-thickness flaps may lead to less bone loss than full-thickness flaps (14). However, partial-thickness flap procedures are technique-sensitive and

require advanced surgical expertise. Moreover, this technique may not be ideal for patients with thin periodontal biotypes, as they are at greater risk of sudden tissue lacerations (15). Furthermore, some studies have shown that full-thickness flap elevation can be as effective as partial-thickness flaps (16). Therefore, this case report aims to present a modified approach using an ADM graft in conjunction with a full-thickness flap to enhance KT around dental implants.

## 2. Case presentation

A 54-year-old non-smoking male presented with the chief complaint of discomfort during brushing and poor oral hygiene around mandibular left implants in the canine, first premolar, second premolar, and first molar regions, which had been placed 10 months prior and were recently restored. The gingival biotype from the mandibular left canine to the first molar was assessed as thin, determined by probing and observing the shadow of the probe through the gingiva, with inadequate KT and shallow vestibules around the implants. (Figure 1). A clinical evaluation was performed, and a previous CBCT scan was reviewed to assess the position of the mental foramen. Local anesthesia containing 2% lidocaine with 1:100,000 epinephrine was administered. Releasing incisions along the restoration margins were made using a no. 15 surgical blade, and a full-thickness flap was elevated. The ADM graft (Regen, Tehran, Iran) was hydrated for 10 minutes with normal saline. The full-thickness flap was apically positioned, trimmed, and stabilized with sutures to the periosteum of the surrounding tissues at the receptor site to establish new vestibules. A graft with a width of 7 mm, a thickness of 1-1.8 mm, and an approximate length of 27 mm was placed at the recipient site and secured to the surrounding periosteum using simple interrupted sutures at the mesial, distal, and coronal aspects of the ADM. Absorbable 4-0 Vicryl sutures, made from a glycolic acid and lactic acid copolymer, were used for the procedure (Figure 2).

Postoperative care included prescribing 500 mg of amoxicillin three times daily for seven days, 400 mg of ibuprofen every 4-6 hours, and a 0.2% chlorhexidine mouthwash three times daily for two weeks. The patient was advised not to brush or chew in the surgical area during the initial four weeks postoperatively. Sutures were removed after 14 days (Figure 3). The width of KT and probing depth (PD) was measured preoperatively and nine months postoperatively. After two weeks, the graft site showed no signs of infection, and the graft was well integrated with the gingival tissue. At the nine-month follow-up a 4 mm increase in KT was observed around the mandibular canine (from 1 mm to 5 mm), and a 5 mm increase around the first premolar (from 1 mm to 6 mm), second premolar, and first molar (from 0 mm to 5 mm for both teeth). There was no significant change in probing

depth, which remained between 1 and 2 mm before and after the procedure. Vestibular depth at the surgical site also improved. The patient was satisfied with the esthetic outcome (Figure 4).

## 3. Discussion

Several studies have identified factors such as reduced alveolar bone thickness due to abnormal tooth positioning in the arch, individual tooth morphology, and improper toothbrushing techniques as contributing to gingival recession and an insufficient amount of keratinized gingiva around teeth (17,18). The presence of an adequate band of KT around implants has been associated with improved restorative outcomes, increased resistance to mechanical trauma, reduced plaque accumulation, enhanced esthetics, and the ability to maintain optimal gingival health (1,4,5,7).

The aim of this study was to achieve sufficient keratinized gingival mucosa thickness using a full-thickness flap combined with an ADM allograft, a freeze-dried, cell-free material (19,20). ADM grafts are derived from human dermis, from which cellular and epidermal components are removed to reduce the risk of immunological reactions and disease transmission. The remaining structure is a connective tissue matrix consisting of proteins, hyaluronan, elastin filaments, a collagen fibrillar network, proteoglycans, and a basement membrane (21). ADM serves as a bioactive scaffold that promotes the migration of fibroblasts, epithelial, and endothelial cells, facilitating its integration into host tissue (7,8). The structural integrity of ADM remains intact, and revascularization is dependent on the vascular channels of the recipient site (9,22). While FGG is traditionally considered the gold standard for increasing the amount of KT, ADM offers several advantages, including the elimination of donor site morbidity, reduced postoperative complications, and superior esthetic outcomes due to better tissue color matching with adjacent areas (3,10). Wei et al. compared ADM and FGG, reporting that esthetic results were superior with ADM, as the demarcation between the ADM graft and surrounding gingiva was less distinct (23). This finding is consistent with our study, where we observed excellent color matching between the surgical area and adjacent gingival tissue, resulting in a highly satisfactory esthetic outcome. Therefore, this technique can be a suitable choice for anterior areas where aesthetics is important.

A 2021 systematic review evaluating various grafting methods, including FGG, ADM, connective tissue graft (CTG), and xenogenic collagen matrix (XCM), demonstrated that using all kinds of soft tissue grafts in combination with APFs significantly increased KT width and led to a reduction in PD, peri-implant soft tissue dehiscence, and plaque index, with FGG showing the greatest increase in KT width (24). However, for mucosal

thickness gains, CTG and ADM showed no significant difference and both outperformed XCM. This may be due to the ADM structure which mimics the native tissue microenvironment more closely and provides superior structural stability (24).

Instead of utilizing a partial-thickness flap, we opted to perform grafting using a full-thickness flap. This approach is less technique-sensitive than partial-thickness flap reflection and lowers the chance of intraoperative complications, such as excessive flap thinning or perforation, and tissue necrosis (16). Chackartchi et al. reported that while placing the graft directly on bone may cause delayed epithelial migration and short-term degenerative changes, keratinization between grafts placed on bone or periosteum shows no significant differences after about a month (25).

The rationale for using partial-thickness flaps stems from studies suggesting that exposing the alveolar bone through flap elevation can stimulate osteoclastic activity, leading to bone resorption (14). However, some authors have concluded that full-thickness flap elevation does not compromise the amount of KT gained, and no significant differences have been observed between the two techniques in terms of KT width (15,16). Similarly, in our study, at the nine-month follow-up, we observed favorable outcomes, including an increase in KT width (about 4-5 mm) and an improvement in vestibular depth.



**Figure 1.** Pre-operative clinical image showing gingival recession and inadequate keratinized mucosa from the mandibular left canine to the first molar area. A shallow vestibule is evident around the implants



**Figure 2.** Surgical site immediately after graft placement. The full-thickness flap was apically positioned and stabilized with an acellular dermal matrix graft secured to the surrounding periosteum.

Autogenous grafts typically exhibit 25–45% shrinkage during healing, with smokers experiencing higher rates (25). ADM grafts, however, have been reported to show even greater shrinkage, likely due to their lower resistance compared to the stable KT formed by FGGs (26). Shrinkage rates for ADM range from 56% to 76% in different studies (10,11,22). In our modified technique, we achieved 4–5 mm of KT from an initial 7-mm graft, resulting in shrinkage between 28% and 42%, an improvement over the outcomes reported in previous studies.

While the modified method using a full-thickness flap demonstrated positive outcomes in this study, it is not without limitations and potential complications. Removing the periosteum from the bone makes graft fixation during the surgical procedure more difficult. Additionally, full-thickness flap elevation can expose the underlying bone, which may prolong the healing process and carry the risk of bone resorption (14). Additionally, the use of ADM as the grafting material introduces higher costs compared to FGGs harvested from the patient's donor site, which might make the procedure less accessible to some patients.



**Figure 3.** Surgical site two weeks post-operatively. The ADM graft shows signs of integration with adjacent gingival tissue, and the sutures have been removed.



**Figure 4.** Clinical image at nine months post-operatively. The surgical area demonstrates a stable, increased KT width, and excellent color matching with adjacent gingiva, achieving favorable esthetic and functional outcomes.

To be more certain about the benefits of using a full-thickness flap without compromising the amount of KT gained, future studies should focus on randomized controlled trials to compare the two techniques. This would provide more reliable evidence on whether the full-thickness flap offers a satisfactory outcome, ensuring the advantages of the method while avoiding potential drawbacks associated with partial-thickness flaps.

## 6. Conclusion

ADM is a successful grafting material that eliminates the need for a donor site, reducing morbidity and providing favorable esthetic outcomes. In this study, performing ADM grafting with a full-thickness flap resulted in sufficient KT while reducing the risks associated with partial-thickness flap techniques. This approach combines the advantages of both ADM and full-thickness flaps, offering a reliable method for achieving optimal functional and esthetic outcomes in gingival grafting procedures.

## Acknowledgements

None.

## Ethics

Written consent for publication was obtained from the patient.

## Author contributions

Mahdi Kадkhodazadeh: Conceptualization, Methodology, Supervision, Writing – review & editing  
Seyed Sepehr Mirebeigi-Jamasbi: Investigation, Writing – Original draft  
Reza Amid: Methodology, Writing – Review & editing  
Seyedeh Zahra Mirsharif: Investigation, Project administration, Writing – Original

## Conflict of interest

The authors declare no conflict of interest.

## Funding

None.

## References

1. Souza AB, Tormena M, Matarazzo F, Araújo MG. The influence of peri-implant keratinized mucosa on brushing discomfort and peri-implant tissue health. *Clin Oral Implants Res.* 2016;27(6):650-5.
2. Narayan SJ, Singh PK, Mohammed S, Patel RK. Enhancing the zone of keratinized tissue around implants. *J Indian Prosthodont Soc.* 2015;15(2):183-6.
3. Bengazi F, Botticelli D, Favero V, Perini A, Urbizo Velez J, Lang NP. Influence of presence or absence of keratinized mucosa on the alveolar bony crest level as it relates to different buccal marginal bone thicknesses. An experimental study in dogs. *Clin Oral Implants Res.* 2014;25(9):1065-71.
4. Schwarz F, Derks J, Monje A, Wang HL. Peri-implantitis. *J Periodontol.* 2018;89 Suppl 1:S267-s90.
5. Wennström JL, Derks J. Is there a need for keratinized mucosa around implants to maintain health and tissue stability? *Clin Oral Implants Res.* 2012;23 Suppl 6:136-46.
6. Monje A, Blasi G. Significance of keratinized mucosa/gingiva on peri-implant and adjacent periodontal conditions in erratic maintenance compliers. *J Periodontol.* 2019;90(5):445-53.
7. Bouri A, Jr., Bissada N, Al-Zahrani MS, Faddoul F, Nouneh I. Width of keratinized gingiva and the health status of the supporting tissues around dental implants. *Int J Oral Maxillofac Implants.* 2008;23(2):323-6.
8. Langer B, Sullivan DY. Osseointegration: its impact on the interrelationship of periodontics and restorative dentistry: Part I. *Int J Periodontics Restorative Dent.* 1989;9(2):84-105.
9. Nemcovsky CE, Moses O. Rotated palatal flap. A surgical approach to increase keratinized tissue width in maxillary implant uncovering: technique and clinical evaluation. *Int J Periodontics Restorative Dent.* 2002;22(6):607-12.
10. Agarwal C, Tarun Kumar AB, Mehta DS. Comparative evaluation of free gingival graft and AlloDerm® in enhancing the width of attached gingiva: A clinical study. *Contemp Clin Dent.* 2015;6(4):483-8.
11. Wei PC, Laurell L, Geivelis M, Lingen MW, Maddalozzo D. Acellular dermal matrix allografts to achieve increased attached gingiva. Part 1. A clinical study. *J Periodontol.* 2000;71(8):1297-305.
12. Liu C, Su Y, Tan B, Ma P, Wu G, Li J, Geng W. Reconstruction of attached soft tissue around dental implants by acellular dermal matrix grafts and resin splint. *Int J Clin Exp Med.* 2014;7(12):4666-76.
13. Cevallos CAR, de Resende DRB, Damante CA, Sant'Ana ACP, de Rezende MLR, Gregghi SLA, Zangrando MSR. Free gingival graft and acellular dermal matrix for gingival augmentation: a 15-year clinical study. *Clin Oral Investig.* 2020;24(3):1197-203.
14. Fickl S, Kerschull M, Schupbach P, Zuhre O, Schlagenhauf U, Hürzeler MB. Bone loss after full-thickness and partial-thickness flap elevation. *J Clin Periodontol.* 2011;38(2):157-62.
15. Ranjbari A, Gholami GA, Amid R, Kадkhodazadeh M, Youssefi N, Mehdizadeh AR, Aghaloo M. Clinical Comparison of Full and Partial Double Pedicle Flaps with Connective Tissue Grafts for Treatment of Gingival Recession. *J Dent (Shiraz).* 2016;17(3):193-200.
16. Mazzocco F, Comuzzi L, Stefani R, Milan Y, Favero G, Stellini E. Coronally advanced flap combined with a subepithelial connective tissue graft using full- or partial-thickness flap reflection. *J Periodontol.* 2011;82(11):1524-9.

17. Bengazi F, Wennström JL, Lekholm U. Recession of the soft tissue margin at oral implants. A 2-year longitudinal prospective study. *Clin Oral Implants Res.* 1996;7(4):303-10.
18. Renkema AM, Fudalej PS, Renkema AA, Abbas F, Bronkhorst E, Katsaros C. Gingival labial recessions in orthodontically treated and untreated individuals: a case - control study. *J Clin Periodontol.* 2013;40(6):631-7.
19. Park JB. Increasing the width of keratinized mucosa around endosseous implant using acellular dermal matrix allograft. *Implant Dent.* 2006;15(3):275-81.
20. 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;124(11):1201-4.
21. Zhan Y, Wang M, Cao X, Liu F. Effectiveness of acellular dermal matrix graft with a coronally advanced flap for the treatment of Miller Class I/II single gingival recession with thin gingival phenotype: study protocol for a split-mouth randomised controlled trial. *BMJ Open.* 2022;12(1):e047703.
22. de Resende DRB, Greggi SLA, Siqueira AF, Benfatti CAM, Damante CA, Ragghianti Zangrando MS. Acellular dermal matrix allograft versus free gingival graft: a histological evaluation and split-mouth randomized clinical trial. *Clin Oral Investig.* 2019;23(2):539-50.
23. Wei PC, Laurell L, Lingen MW, Geivelis M. Acellular dermal matrix allografts to achieve increased attached gingiva. Part 2. A histological comparative study. *J Periodontol.* 2002;73(3):257-65.
24. Tavelli L, Barootchi S, Avila-Ortiz G, Urban IA, Giannobile WV, Wang HL. Peri-implant soft tissue phenotype modification and its impact on peri-implant health: A systematic review and network meta-analysis. *J Periodontol.* 2021;92(1):21-44.
25. Chackartchi T, Romanos GE, Sculean A. Soft tissue-related complications and management around dental implants. *Periodontol 2000.* 2019;81(1):124-38.
26. Basegmez C, Karabuda ZC, Demirel K, Yalcin S. The comparison of acellular dermal matrix allografts with free gingival grafts in the augmentation of peri-implant attached mucosa: a randomised controlled trial. *Eur J Oral Implantol.* 2013;6(2):145-52.