

## Graftless Soft Tissue Augmentation with Volumetric-Stable Collagen Matrix: Case Series and Early Results

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### Abstract

The absence of the soft-tissue graft harvesting reduces the time of surgery and makes the postoperative less painful for the patient. In such a situation, two treatment plans can be offered to the patient. Option number one is the use of a subepithelial connective tissue graft. This technique is well documented in the literature, has long term results and is considered the gold standard. Alternatively, it is suggested to use volumetric-stable collagen matrix, because it allows you to reduce pain after surgery, reduce the duration of manipulations, and the amount of material is unlimited.

In this article we present two graftless clinical case with Geistlich Fibro-Gide® as a collagen matrix.

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### Introduction

Biomaterials are widely used in dentistry to solve problems with insufficient soft tissue volume. Peri-implant soft tissue deficiency in width and height can impair the aesthetics, function and even survival of dental implants<sup>1,2</sup>. Autogenous grafts are used to correct tissue deficiencies<sup>3</sup> and remain the gold standard for soft tissue augmentation due to good volume stability. However, autogenous grafts always require a donor site, which can lead to complications and possible damage to anatomical structures<sup>4</sup>.

The biomaterial development presented alternatives to autogenous grafts<sup>5</sup>. These include allografts, xenografts, and synthetic soft tissue substitutes (collagen matrices)<sup>6-8</sup>. Collagen matrices showed acceptable tissue integration. When using a collagen matrix, the time of surgical intervention is significantly

reduced in comparison with autogenous grafting<sup>9</sup>. The augmented areas have an appearance similar to the surrounding natural soft tissue in texture and color, making them preferred in aesthetic areas<sup>9</sup>.

Recently, a new highly porous and volume-stable collagen matrix has been developed for the soft tissue augmentation around teeth and dental implants<sup>10</sup>. Such a biomaterial is biocompatible, allows the germination of blood vessels and progenitor cells, and withstands the mechanical forces resulting from suturing and chewing, thereby maintaining tissue volume. In vivo and in vitro studies have demonstrated the optimal mechanical, biological, and anatomical properties of such matrices<sup>11-13</sup>. The collagen matrix consists of 60–96% pork collagen I and III types and 4–40% elastin, has an average pore diameter of 92 µm and a volumetric porosity of 93% with interconnected pores. The rigidity of the framework was achieved through chemical crosslinking. Clinically, soft tissue augmentation with the use of a matrix resulted in an increase in volume that is not inferior to connective tissue grafts in implant treatment in the aesthetic zone<sup>14</sup> and minimal loss of soft tissue thickness six months after dental implant treatment<sup>15</sup>.

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The aim of this study is to present two clinical cases and early outcomes with the use of volumetric-stable collagen matrix. All patients gave written consent prior to the surgical procedure.

### Case Report

#### Clinical case 1.

Twenty-seven-year-old patient came to the practice for tooth 46 and 37 implant treatment (Figure 1 a,b). He has no chronic and acute conditions in his medical history; teeth were extracted 5 years ago due to apical periodontitis and no possibilities for the tooth restorations. Initial gingival width was 1.7 mm on the right and 2 mm on the left.



A



B

**Figure 1.** Initial situation. a. Right posterior mandibula. b. Left posterior mandibula.

Patient accepted the following treatment plan: soft tissue augmentation with delayed implant placement. The surgical protocol included the following stages: supracrestal incision with full-thickness flap elevation. Setting (Figure 2) the volume stable collagen matrix (Fibro-Gide® prototype, Geistlich Pharma, Wolhusen, Switzerland). The flap was closed using non-absorbable 4-0 nylon sutures (Figure 3). The patient was then instructed to rinse their mouths twice daily with chlorhexidine (0.12%) for 2 weeks. Anti-inflammatory therapy (ibuprofen 400 mg) was prescribed for pain or swelling.



A

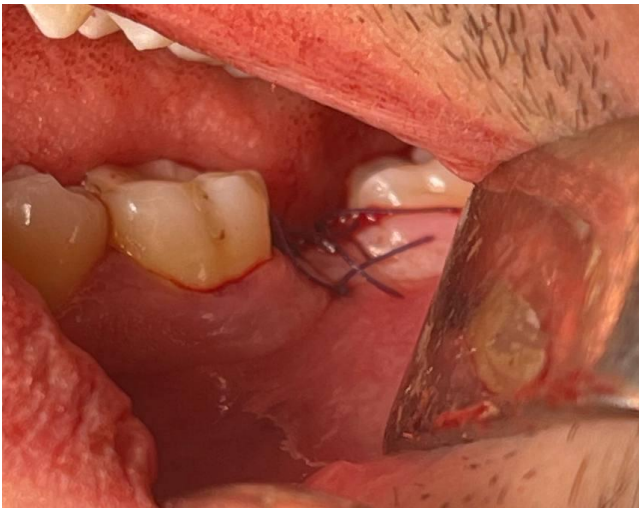


B

**Figure 2.** Volume stable collagen matrix in situ. a. Right posterior mandibula. b. Left posterior mandibula.



A



B

**Figure 3.** Sutured operation field. a. Right posterior mandibula. b. Left posterior mandibula.

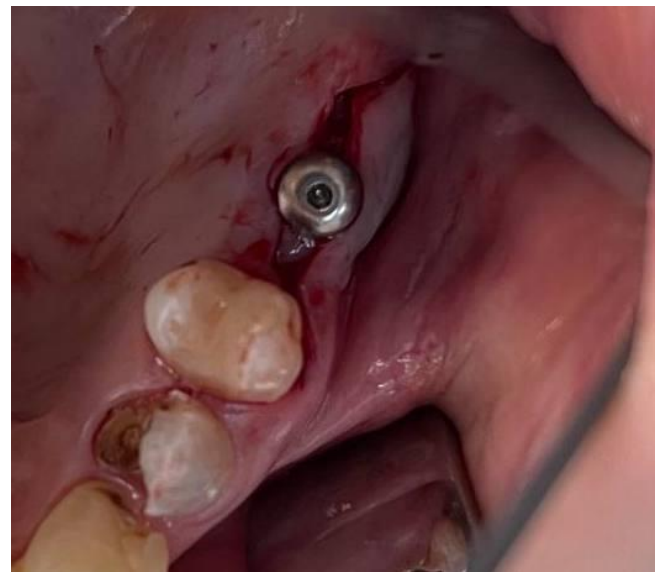
The patient underwent two follow-up visits. The first one was for the suture removal; the soft tissue width was 10.3 mm on the right and 15.1 mm on the left. The second visit demonstrated 8.4 mm on the right and 10.0 mm on the left. Then patient had no opportunity to carry on the treatment due to COVID-19. The next appointment is still under discussion.

### Clinical case 2.

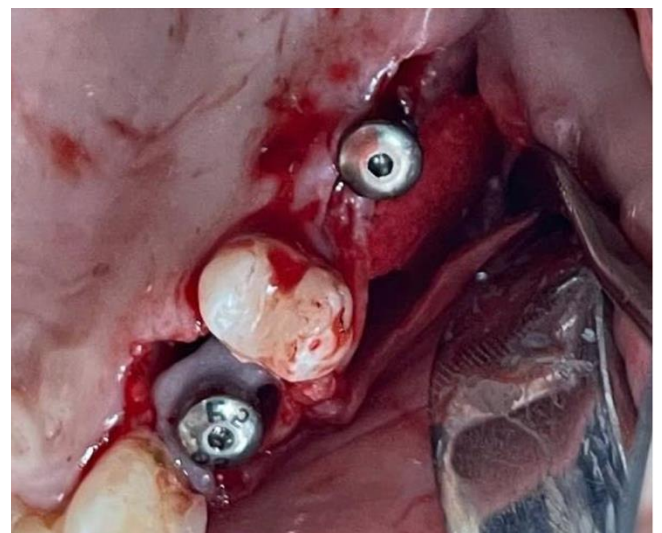
Thirty-two-year-old patient came to the practice for tooth 23 extraction and following implant treatment. He has no chronic and acute conditions in his medical history. Implant 25 was placed one month before the visit. Initial width was 10 mm with the healing abutment.

Patient accepted the following treatment plan: immediate implant placement in the 23-tooth region, soft tissue augmentation in the 25

and 23 implants. The surgical protocol included the following stages: supracrestal incision (Figure 4) with full-thickness flap elevation. Setting (Figure 5) the volume stable collagen matrix (Fibro-Gide® prototype, Geistlich Pharma, Wolhusen, Switzerland). The flap was closed using non-absorbable 4-0 nylon sutures (Figure 6). The patient was then instructed to rinse their mouths twice daily with chlorhexidine (0.12%) for 2 weeks. Anti-inflammatory therapy (ibuprofen 400 mg) was prescribed for pain or swelling.



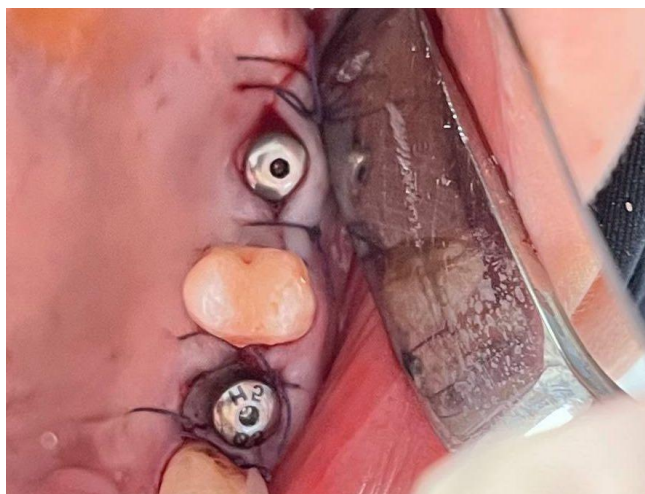
**Figure 4.** Performed incision in the left maxilla.



**Figure 5.** Placed matrix in the 23 and 25 implant regions.

The patient underwent two follow-ups as well. The first one was for the suture removal: the soft tissue width was 9.7 mm in implant 23 region

and 20.1 mm in implant 25 region. The second visit demonstrated 9.0 mm in implant 23 region and 15.5 mm in 25 implant region.



**Figure 6.** Closed operation field in the 23 and 25 implant regions.

## Discussion

Soft tissue deficiency is an urgent problem in modern dental implant practice<sup>16</sup>. The original implant treatment protocols required the patient to undergo several surgeries for implant placement<sup>17</sup>. In most cases, patients were required to harvest soft tissues from their own donor site. In this clinical case, the use of a modern patient rehabilitation protocol is presented.

The results of this study show a decrease in keratinized tissue 6 months after augmentation. Collagen matrix demonstrated good healing dynamics and clinical behavior, achieving similar clinical results in terms of an increase in keratinized tissue using a free connective tissue graft. In addition, it has shown excellent properties while significantly reducing surgery time and patient morbidity<sup>18</sup>.

## Conclusion

In conclusion, the results of this study show that this 3D collagen matrix is an effective and predictable tool for soft tissue augmentation in the implant area, and its use is associated with significantly lower patient morbidity and good aesthetic results.

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## References

1. Marzadori M, Stefanini M, Sangiorgi M, Mounssif I, Monaco C, Zucchelli G. Crown lengthening and restorative procedures in the esthetic zone. *Periodontol* 2000. 2018;77(1):84-92
2. Bassetti, M.; Kaufmann, R.; Salvi, G.E.; Sculean, A.; Bassetti, R. Soft tissue grafting to improve the attached mucosa at dental implants: A review of the literature and proposal of a decision tree. *Quintessence Int.* 2015; 46: 499–510
3. Griffin, T.J. Cheung, W.S. Zavras, A.I. Damoulis, P.D. Postoperative complications following gingival augmentation procedures. *J. Periodontol.* 2006; 77: 2070–2079.
4. Reiser, G.M. Bruno, J.F. Mahan, P.E. Larkin, L.H. The subepithelial connective tissue graft palatal donor site: Anatomic considerations for surgeons. *Int. J. Periodont. Restor. Dent.* 1996; 16: 130–137.
5. Sanz M, Lorenzo R, Aranda JJ, Martin C, Orsini M. Clinical evaluation of a new collagen matrix (Mucograft prototype) to enhance the width of keratinized tissue in patients with fixed prosthetic restorations: a randomized prospective clinical trial. *J Clin Periodontol.* 2009 Oct;36(10):868-76.
6. Yukna RA, Tow HD, Carroll PB, Vernino AR, Bright RW. Comparative clinical evaluation of freeze-dried skin allografts and autogenous gingival grafts in humans. *J Clin Periodontol.* 1977;4(3):191-9.
7. Wainwright DJ. Use of an acellular allograft dermal matrix (AlloDerm) in the management of full-thickness burns. *Burns.* 1995;21(4):243-8.
8. Langer R, Vacanti J. Advances in tissue engineering. *J Pediatr Surg.* 2016;51(1):8-12.
9. Schmitt CM, Tudor C, Kiener K, Wehrhan F, Schmitt J, Eitner S, Agaimy A, Schlegel KA. Vestibuloplasty: porcine collagen matrix versus free gingival graft: a clinical and histologic study. *J Periodontol.* 2013;84(7):914-23.
10. Thoma DS, Zeltner M, Hilbe M, Hämmerle CH, Hüsler J, Jung RE. Randomized controlled clinical study evaluating effectiveness and safety of a volume-stable collagen matrix compared to autogenous connective tissue grafts for soft tissue augmentation at implant sites. *J Clin Periodontol.* 2016;43(10):874-85.
11. Thoma DS, Nänni N, Benic GI, Weber FE, Hämmerle CH, Jung RE. Effect of platelet-derived growth factor-BB on tissue integration of cross-linked and non-cross-linked collagen matrices in a rat ectopic model. *Clin Oral Implants Res.* 2015 Mar;26(3):263-70
12. Thoma DS, Villar CC, Cochran DL, Hämmerle CH, Jung RE. Tissue integration of collagen-based matrices: an experimental study in mice. *Clin Oral Implants Res.* 2012;23(12):1333-9.
13. Ferrantino L, Bosshardt D, Nevins M, Santoro G, Simion M, Kim D. Tissue Integration of a Volume-Stable Collagen Matrix in an Experimental Soft Tissue Augmentation Model. *Int J Periodontics Restorative Dent.* 2016;36(6):807-815.
14. Zeltner M, Jung RE, Hämmerle CH, Hüsler J, Thoma DS. Randomized controlled clinical study comparing a volume-stable collagen matrix to autogenous connective tissue grafts for soft tissue augmentation at implant sites: linear volumetric soft tissue changes up to 3 months. *J Clin Periodontol.* 2017;44(4):446-453.
15. Thoma DS, Naenni N, Benic GI, Hämmerle CH, Jung RE. Soft tissue volume augmentation at dental implant sites using a volume stable three-dimensional collagen matrix - histological outcomes of a preclinical study. *J Clin Periodontol.*

2017;44(2):185-194.

16. Farkhshatova R.R., Gerasimova L.P., Kabirova M.F. Use of the 3D collagen matrix FibroMATRIX for the regeneration of soft tissues of the oral cavity in the treatment of Miller class I gingival recessions. *Endodontics Today*. 2020;18(3):32-38.
17. Volberg R.V., Vali M.A., Mordanov O.S. Vertical root fracture – immediate implant placement, early loading and recession plastic surgery. A case report. *Endodontics Today*. 2019;17(3):56-60.
18. Nima Naddafpour, Asieh Mozaffari, Baharak Ghaedi, Kimia Najafi, Arash Ghaffari. Efficacy of Acellular Dermal Matrix Versus Free Gingival Graft for Increasing the Width of Attached Gingiva: A Clinical Trial. *Journal of International Dental and Medical Research*. 2019; 12 (4):1426-1432