



## Case report

## Treatment of class I Sibert alveolar ridge defects with volume stable collagen matrix. A case report

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## A B S T R A C T

**Introduction and importance:** The soft tissue volume and its stability around dental implants are important for the final aesthetic outcome.**Case presentation:** A 39-year-old female was referred for dental implant placement for her missing tooth. Following attachment of the cover screw VCMX was used to simultaneously augment buccal ridge defect. Patient was seen 2 weeks after surgery for follow up where sutures were removed. After 3 months, patient received her final crown and been on follow up for 9 months where a successful well-functioning restoration with clinically healthy soft tissue and optimal profilometric outcome were maintained.**Clinical discussion:** This approach is relatively simple, less invasive and time saving as it eliminates the need for another surgical donor site to manage the defect.**Conclusions:** The present report showed that VCMX was effective in soft tissue augmentation at implant sites in aesthetic zone.**Clinical relevance:** Within the limits of this study, the positive results suggest that the volume stable collagen matrix (VCMX) may be a reliable option in treatment of siebert class I ridge defects. VCMX was associated with less amount of pain or discomfort and reduced patient morbidity.

## 1. Introduction

A considerable amount of volume loss, particularly in the buccal segment of the ridge is evidenced following tooth extraction. To make up for the volume loss, a variety of surgical interventions may be required [1]. *Chappuis et al.*, found wound healing of extraction sockets results not only in dimensional alterations of the underlying bone but also in surrounding soft tissue architecture changes. However, research related to post-extraction dimensional alterations had mainly focused on the biology of bone. Even though, the appearance of the soft tissue and its relationship with the surrounding teeth had been considered a critical factor in facial aesthetics [2,3].

In post-extraction sites, *Seibert*, suggested a classification for ridge defects based on the amount of volume loss, divided into three classes: Class I: buccolingual loss of the ridge contour, Class II: apicocoronal loss of the ridge contour and Class III: combined loss of the ridge contour [4].

Ridge augmentation procedures prior to conventional fixed prosthodontic or implant therapy are indicated when an adequate width or height of the alveolar ridge is not present. Soft tissue augmentation procedures are used to correct aesthetic defects, such as loss of the interdental papilla and improper emergence profile [3]. When sufficient bone is present for implant installation, The gold standard for this

procedure is the use of a subepithelial connective tissue graft [5]. the main drawback is the need for a second surgical site for tissue collection. This can lead to complications such as palatal bleeding, pain, swelling, infection, and necrosis [6,7]. To overcome the above limitations of autologous CTG, a volume stable cross-linked porcine-derived collagen matrix (VCMX) was developed. VCMX contains a single porous layer that enhances the process of angiogenesis, the fibroblasts' growth, the biosynthesis of the matrix, and the integration of the tissue [8]. On the other hand, from the collagen matrix that could be used normally in an open environment, VCMX needs submerged healing. A lot of preclinical and clinical research inspecting VCMX detected a promising outcome in terms of the volume gain, with no considerable adverse sequelae noted [8,9]. Despite successful clinical applications, there is little knowledge about the long-term behaviour of grafts in the augmented region regarding volumetric stability.

## 2. Clinical presentation

The presented case report is recorded according to the SCARE checklist recommendations [10]. A female Caucasian patient was treated at a private practice in Al-sharqia governorate, Egypt, between December 2020 and April 2021 and the follow up period extended to

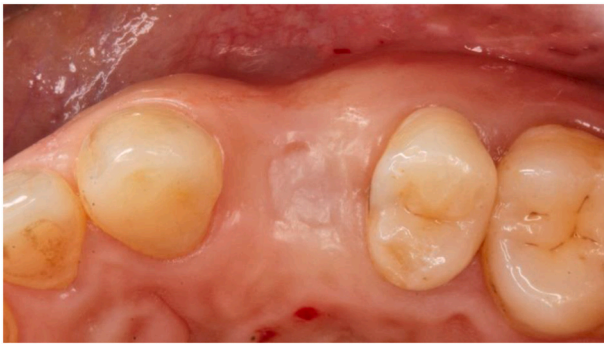
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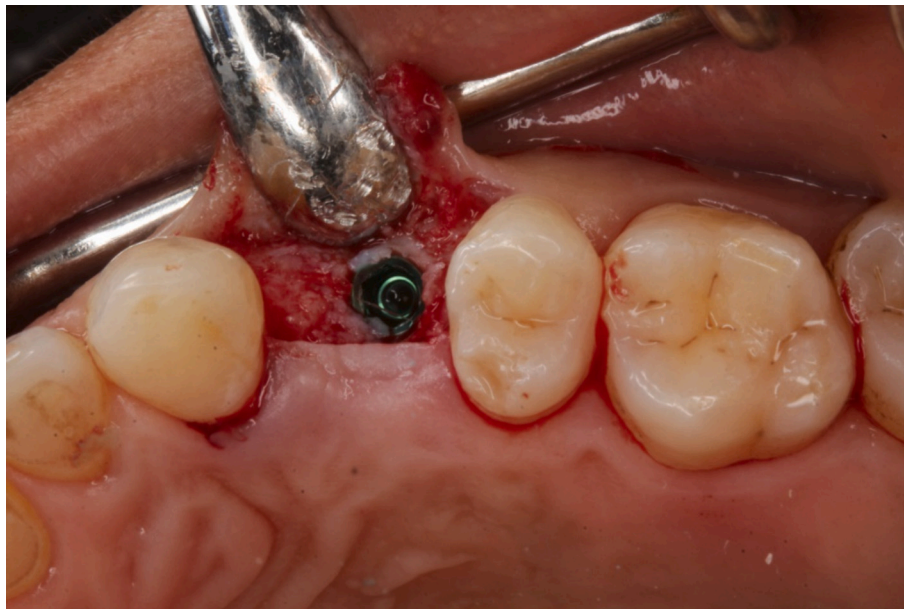
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**Fig. 1.** Preoperative occlusal view showing horizontal ridge deficiency around the edentulous space.



**Fig. 2.** Flap reflection and placement of dental implant.

April 2022.

Patient was a 39-years-old healthy, non-smoker, with missing upper left first premolar that needed rehabilitation by dental implant. Upon clinical examination, Siebert class I ridge defect was noted buccally (Fig. 1), therefore implant site enhancement was planned in mind to achieve optimal results. At consultation, patient received oral hygiene instruction with emphasis on gumline brushing with an extra soft toothbrush and interdental cleaning with interdental brushes and dental floss. Oral hygiene was reassessed and reinstructed as necessary at subsequent visits. Before surgery, patient had scaling and root debridement done.

### 3. Case management

Written informed consent was obtained from the patient. Local infiltration anaesthesia of Articaine HCL 4 %<sup>1</sup> containing epinephrine at a concentration of 1:100,000 were administered.

The surgical approach consisted of a mid-crestal incision down to bone and sulcular incisions around the neighbouring teeth to help in complete elevation of the flap. After the crestal incision, full thickness elevation of the flap was done at the crest ensuring denuded bone

surface to accept the implant preparation step then a partial thickness flap was reflected toward the buccal side [11]. Following complete reflection of the combined full/partial thickness flap, dental implant<sup>2</sup> with suitable diameter and height according to the site was placed in the right position. Cover screw<sup>3</sup> was placed over the implant and secured with screwdriver to its final position (Fig. 2). Following attachment of the cover screw VCMX<sup>4</sup> with an initial dimension of 15 × 20 × 6 mm was used. Graft thickness was adapted to the defect with a scalpel as deemed appropriate by the surgeon (Fig. 3). Sterile saline was applied onto the graft and slight compression was made. The graft was further trimmed with scissors to arrive at the ideal dimensions. Following a superficial incision to release muscle tension, the matrix was brought into the buccal envelope and fixed with single sutures<sup>5</sup> onto the buccal mucosa (Fig. 4). The flap then was sutured in its original place using simple interrupted sutures (Fig. 5). Patient received antibiotics for 1 week

(amoxicillin + clavulanic acid ·1000 mg b.d.s)<sup>5</sup> and an anti-inflammatory (ibuprofen b.d.s).<sup>6</sup> Patient was instructed to pass the first 24 h and start rinsing twice daily with a 0.12 % chlorhexidine digluconate<sup>7</sup> mouth rinse and to avoid mechanical plaque control at the site of surgery for 15 days. Sutures were removed 2 weeks after surgery.

### 4. Clinical outcomes

Postoperative healing was eventful. Three months after surgery, the site was re-opened to attach a stock healing abutment which was secured in place for 2 weeks to create an ideal emergence profile (Fig. 6). After that patient received her permanent crown and were on follow up period up to 9 months (Fig. 7). To assess the volumetric differences between baseline and 9 months postoperatively, an impression record was taken for the patient before surgery and 9 months follow up. Casts were poured and transferred to digital replica using an optical scanner.

<sup>2</sup> Jdental care – Italy.

<sup>3</sup> Jdental care – Italy.

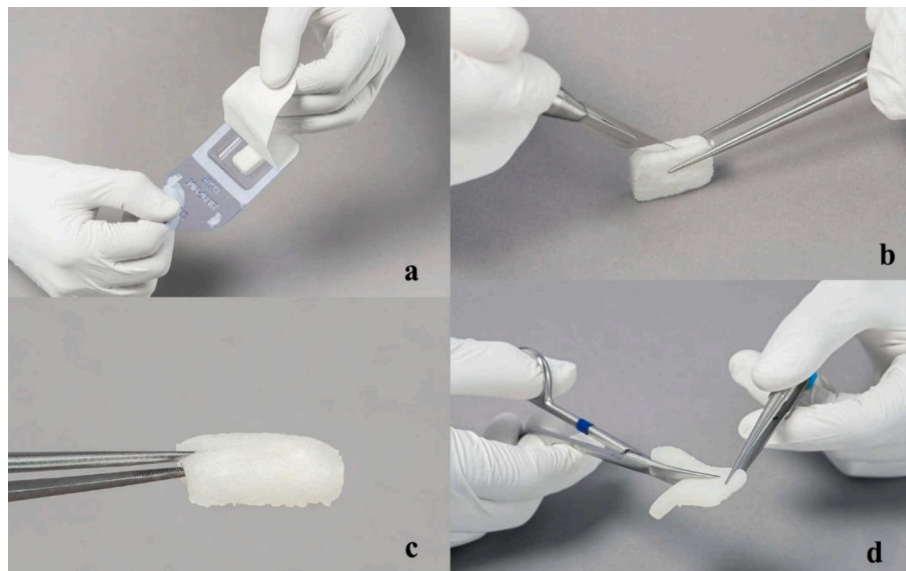
<sup>4</sup> Geistlich Pharma AG (Wolhusen, Switzerland).

<sup>5</sup> Amoxil MUP Egypt.

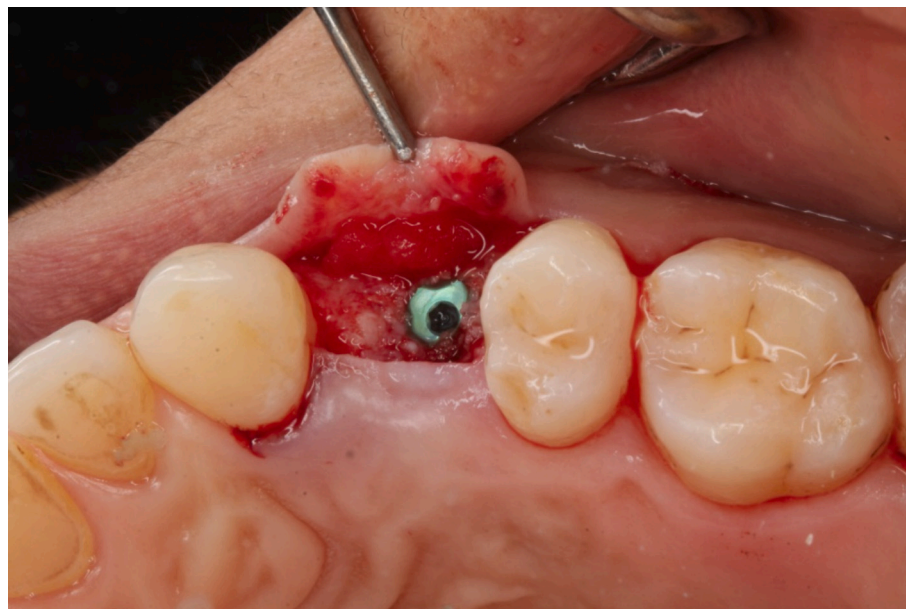
<sup>6</sup> Amoun Egypt.

<sup>7</sup> Antiseptol Kahira Pharm Egypt.

<sup>1</sup> Septodont LTD, Septanest 1:100000.



**Fig. 3.** Preparation of the VCMX, **a:** Unpacking the sealed package, **b:** Splitting of the collagen matrix with a scalpel to the desired thickness, **c:** Wetting the collagen matrix with saline solution, **d:** Trimming the collagen matrix to the desired size and shape.



**Fig. 4.** VCMX was placed into the buccal envelope and fixed with a single suture.

Superimposing the two-time points replicas utilizing the best fit algorithm by using reference points from the tooth surfaces. The implant site region was delineated by the mucogingival line, the mesial and distal papillary midline, and the alveolar crest. Thus, alterations in volume between the digitized superimposed replicas could be recorded (Fig. 8) [12]. Clinical examination showed well-functioning restoration with clinically healthy surrounding soft tissue, cone beam CT control revealed crestal bone stability and adequate soft tissue thickness (Fig. 9). Volumetric assessment showed a significant increase in soft tissue volume ( $29.48 \text{ mm}^3$ ) at 9 months compared to baseline record.

## 5. Discussion

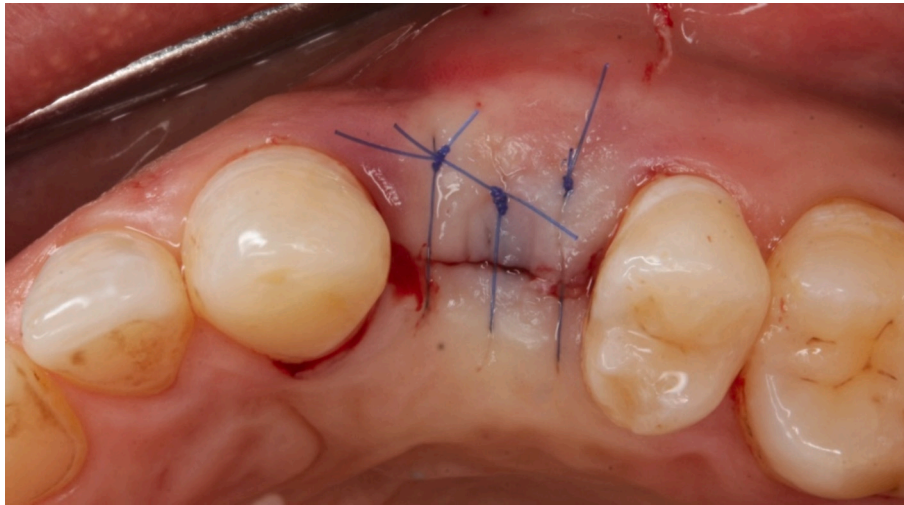
Since the final aesthetic outcome of implant therapy is gaining considerable attention both from patients and dental professionals [13]. Thus, tissue augmentation approaches are frequently needed as an

adjunct to single implant placement in the aesthetic zone [1,2]. That is why much more attention has been paid recently to soft tissue augmentation around dental implants [14].

When sufficient bone is present for implant installation, the gold standard is the use of a subepithelial connective tissue graft (SCTG) harvested from the patients' palate and placed into a pocket on the buccal-facing aspect of the placed implant to increase the mucosal thickness at implant sites. [3,15] However, transplantation of autogenous tissue is always accompanied by patient morbidity stemming from the donor site, which has been a focus of several clinical trials lately [6,7].

In this case report, siebert class I ridge defect was managed by a soft tissue substitute where VCMX was used to augment the ridge defect at the time of implant placement surgery aiming to decrease patient morbidity resulting from autogenous soft tissue graft harvesting. This approach is relatively simple, less invasive and time saving as it





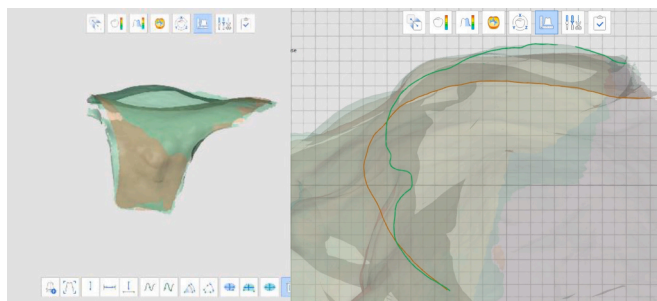
**Fig. 5.** primary wound closure using simple interrupted sutures.



**Fig. 6.** Postoperative buccal view showing soft tissue emergence profile before crown placement after 3 months of surgery.



**Fig. 7.** Postoperative occlusal view at 9 months follow up.



**Fig. 8.** Digital model showing Isolated section of the implant site to calculate the volumetric changes between time intervals. The difference between the red and green curves is the volumetric gain in soft tissue profile. (For interpretation of the references to colour in this figure legend, the reader is referred to the web version of this article.)

eliminates the need for another surgical donor site to manage the defect. VCMX contains a single porous layer that enhances the process of angiogenesis, the fibroblasts' growth, the biosynthesis of the matrix, and the integration of the tissue [8]. In addition, VCMX showed significant reduction of pain perception after surgery, moreover this approach resulted in a stable profilometric outcomes over the 9 months follow up period which would ultimately lead to improved patient satisfaction. Randomized clinical trials with long-term follow-up would be of help in evaluating the benefits and limitations of using the VCMX in management of alveolar ridge defects.

## 6. Conclusion

Siebert class I ridge defect can be successfully treated by the VCMX that yielded good aesthetic and functional results in addition to the surgical ease and perfect adaptation to the surgical site.

## Summary

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| <ul style="list-style-type: none"> <li>• Why is this case new information?</li> <li>• What are the keys to successful management of this case?</li> <li>• What are the primary limitations to success in this case?</li> </ul> | <ul style="list-style-type: none"> <li>• This case report provides relatively long term follow up for management of ridge defects using volume stable collagen matrix</li> <li>• It provides a volumetric assessment tool to validate the stability of the results</li> <li>• Visibility and access</li> <li>• Primary closure with delicate manipulation</li> <li>• Diligent patient home care</li> <li>• Poor blood supply associated with thin thickness soft tissue flap</li> <li>• Failure to achieve primary closure</li> <li>• Poor patient home care</li> </ul> |
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## Patient declaration of consent

Written informed consent was obtained from the patient.

## Ethical approval

The Ain Shams faculty of dentistry Research Ethics Committee had reviewed and accepted the proposal in September 2020 in line with the Helsinki Declaration of 1975. Reference number: REC-092002.

## Funding

No external funds were available for this study.

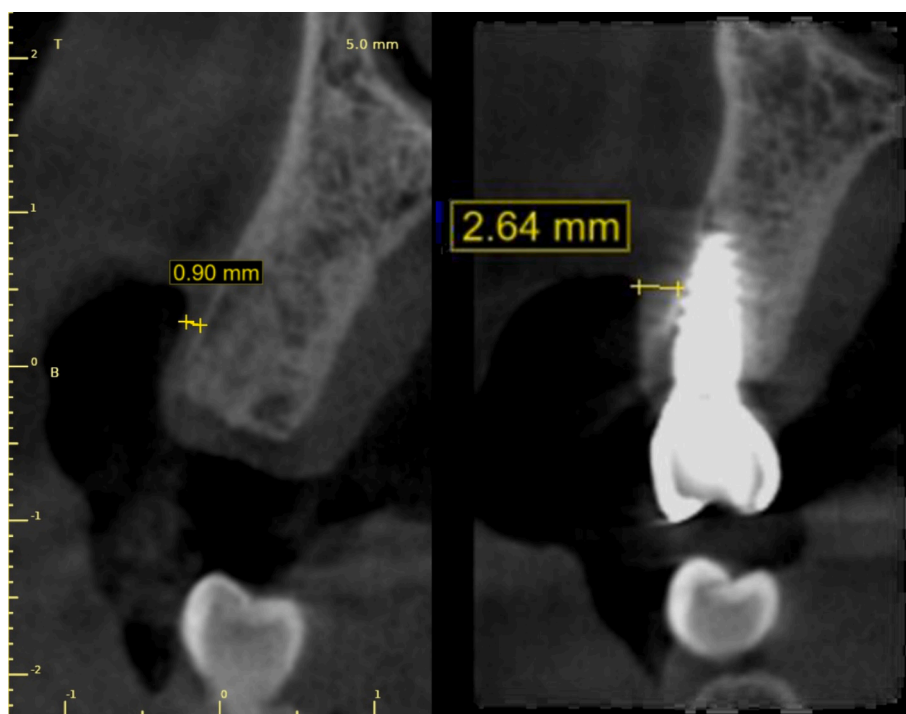
## Author contribution

hmed Hamdy: Concept/Design, Surgical intervention, Data collection/interpretation, Drafting article.

Suzan Seif Allah Ibrahim: Concept/Design, Drafting article, Critical revision of article, Approval of article.

Dalia Ghalwash: Concept/Design, Drafting article, Critical revision of article.

Doaa Adel-Khattab: Concept/Design, Data analysis/interpretation,



**Fig. 9.** Pre and Postoperative CBCT sagittal cut showing soft tissue measurements at 2 mm coronal to the mucogingival junction.

Statistics; Drafting article, Critical revision of article, Approval of article.

## Guarantor

Ahmed Hamdy Mahmoud.

## Research registration number

1. Name of the registry: clinicaltrials.gov.
2. Unique identifying number or registration ID: NCT04873830.
3. Hyperlink to your specific registration (must be publicly accessible and will be checked): ClinicalTrials.gov PRS: Record Summary NCT04873830.

## Conflict of interest statement

The authors report no conflicts of interest related to this study.

## Data availability

All clinical data and photos are available upon request.

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