The aim of this report is to present a technique for buccal soft tissue contour augmentation with the use of a porcine volume-stable collagen matrix (VSCM). Augmentation of buccal soft tissue at the time of implant placement is often a necessity but is mostly performed using autogenous tissue. The technique using a VSCM can be done at the time of implant placement or, in the case of a two-stage procedure, at the time of implant uncovering. Here, clinical outcomes are reported in two cases when using VSCM concurrently with implant placement at sites in need of buccal contour augmentation to achieve a functional, esthetic result. The use of a xenograft poses several advantages over autogenous tissue while providing similar gains in soft tissue thickness. By eliminating the need to harvest a soft tissue graft from the palate, patient morbidity is reduced, and the reliance on palatal tissue thickness, to determine the amount of achievable augmentation, is eliminated.


Reduced buccal tissue thickness around implants has long been associated with gingival recession, increased bone loss, and reduced esthetics. Many techniques and materials have therefore been proposed to augment buccal soft tissue volume and contour in conjunction with implant placement. Autogenous soft tissue grafts harvested from the palate or tuberosity are widely used but require an additional surgical site, often leading to increases in morbidity and patient discomfort. It also presents with limitations in the volume that can be obtained, as the availability of palatal tissue thickness can vary.

The use of a new volume-stable collagen matrix (VSCM), a xenograft scaffold used to augment buccal soft tissue, has recently been proposed to overcome the limitations and associated morbidity of autogenous soft tissue grafts. VSCM has been shown to potentially be as effective as autogenous tissue grafts when used with healed implant sites. The soft tissue scaffold is composed of reconstituted porcine type I and III collagen with a low level of cross-linking to provide for volume stability while allowing for angiogenesis and connective tissue formation with a minimal inflammatory response in relevant preclinical models and in human clinical studies.

Israel Puterman, DMD, MSD
Matthew Fien, DDS
Juan Mesquida, DDS
Ferran Llansana, DDS
Guillermo Bauza, PhD/Myron Nevins, DDS

Correspondence to: Dr Israel Puterman, 5454 Wisconsin Ave, Suite 1550, Chevy Chase, MD 20815, USA. Fax: (+1) 240-465-0598. Email: ip@implantsdc.com

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To date, there have been publications demonstrating the use of VSCM at previously placed implants,\textsuperscript{16} at restored implant sites,\textsuperscript{17} and for root coverage.\textsuperscript{18,19} There are no known publications involving its use at the time of implant placement for gingival biotype conversion. Therefore, the present paper aims to illustrate the use of this novel soft tissue matrix in a series of two cases with the application of VSCM concurrently with implant placement at sites in need of buccal contour augmentation to achieve an aesthetic and functional result, thereby reducing the need to harvest an autogenous soft tissue graft. Xenograft placement at the time of implant insertion has the potential to negate the need for further surgical procedures, provided that sufficient augmentation is achieved.

Materials and Methods

The VSCM soft tissue augmentation procedure can be completed in a similar fashion to previously described soft tissue augmentation procedures.\textsuperscript{20} The main difference is the lack of a need for an autogenous harvesting site. The VSCM is available in two sizes and is best trimmed using a sharp scalpel blade in a dry state to achieve the desired contours. The tissue-facing edges of this material should be beveled to provide a smooth transition from native gingiva to the implanted material.

After full- or partial-thickness flap reflection, the soft tissue scaffold can be trimmed to the exact dimension of the defect requiring augmentation. This is completed with a sharp 15c blade with the material in a dry state. Hydration of the material, if desired, can be completed either extraorally by dipping it in a biologic modifier, such as platelet-rich fibrin, or intraorally with saline or blood from the surgical site. When a minimal envelope flap is reflected, it may be possible to stabilize the VSCM without fixation to the underlying bone or periosteum. In cases where a larger flap has been reflected or when there is not a defined concavity to contain the soft tissue scaffold, apical periosteal biting stabilization sutures or traditional horizontal mattress sutures can be used to limit movement of the material during healing.

Case 1

A 27-year-old nonsmoking woman with congenitally missing maxillary lateral incisors was referred for implant placement to replace the maxillary right and left lateral incisors. Orthodontic treatment had recently been completed to improve her occlusion and interproximal tooth spacing. Clinical examination and CBCT scans revealed sufficient alveolar ridge dimensions to accommodate implant placement, with slight labial ridge concavities (Figs 1 and 2).

A surgical procedure involving placement of two implants using a surgical guide was planned. Fixed...
screw-retained provisional restorations were fabricated in order to provisionize the implants if sufficient immediate primary stability allowed for it. Surgery was performed per the manufacturer’s guided protocol, and two $3.3 \times 10^{-3}$-mm implants (Bone Level Tapered Roxolid, Straumann) were placed (Fig 3). While the right lateral incisor achieved sufficient primary stability for provisionization ($> 35 \text{ Ncm}$), the left implant did not ($\approx 20 \text{ Ncm}$).

With sufficient alveolar ridge dimensions, soft tissue augmentation options to improve the labial contour included autogenous tissue, allograft, or VSCM. Following implant placement, both labial ridges were augmented with VSCM (FibroGide, Geistlich). A single piece of VSCM ($15 \times 20 \text{ mm}$) was split into two pieces and trimmed as needed (Fig 4). Each piece was then placed dry into the prepared full-thickness labial envelope flaps.

The fixed provisional restoration was screwed into the right lateral incisor implant, and a healing abutment was placed into the left lateral incisor implant. Each site was closed with two simple interrupted resorbable sutures (Glycolon, Resorba) in the interproximal positions (Fig 5). With minimal flap elevation, fixation of the VSCM was not necessary, as it was easily stabilized in place due to pressure exerted by the flap. The patient’s preexisting Essix retainer was adjusted to accommodate for the immediate provisional so it could still be used for the left lateral incisor.

Both surgical sites healed uneventfully, and the patient followed postsurgical instructions regarding a lack of function on the immediate provisional implant restoration (Fig 6). A 2-month healing period was allowed for the left lateral incisor implant prior to placement of the screw-retained fixed provisional restoration. Following an additional healing period of 2 months, implant stability was tested by means of reverse torque, and the patient was referred back to the restorative dentist for definitive restoration (Fig 7).

**Case 2**

A 52-year-old nonsmoking man with a noncontributory medical history presented with missing tooth 14 (FDI system), having been extracted several years prior (Fig 8). On clinical exam, a buccal ridge concavity in the area of the missing tooth was noted. A CBCT scan was acquired, and the ridge height/width was determined to be sufficient for implant
placement (Fig 9). Following elevation of a full-thickness flap, buccal bone exostoses were evident on adjacent premolar and canine teeth (Fig 10). A single 4.1 × 10–mm implant (Bone Level Tapered Roxolid) was placed according to the manufacturer’s recommendations, with an insertion torque > 40 Ncm.

In order to provide a consistent buccal contour, consideration was given to either remove the exostoses on adjacent teeth or to augment the contour at the implant site. Due to the fact that exostoses extended to numerous teeth in the quadrant, removal would require a significantly more invasive procedure. It was therefore decided to augment the implant site, and a small buccal envelope flap was elevated. Typical options for augmentation include guided bone regeneration or soft tissue augmentation with autogenous connective tissue graft. To avoid a second surgical site, the implant site was augmented with a nonhydrated VSCM after adequately reshaping it to the desired volume (Fig 11). Presence of the adjacent exostoses aided in the compartmentalization of the VSCM, and no stabilization was required. A healing abutment was secured on the implant, and the area was sutured with two simple interrupted resorbable sutures (Glycolon; Fig 12).

After 2 months of healing, a reverse torque test was performed on the implant, and the patient was referred back to his restorative dentist for fabrication of a restoration. The
site healed uneventfully, and a fully restored buccal contour was evident (Figs 13 and 14).

Discussion

The clinical impact of the alveolar hard and soft tissue dimensions and integrity in the peri-implant tissue dynamics after immediate implant placement has been extensively studied. Studies on the limitations associated with a thin buccal alveolar ridge and/or a limited soft tissue dimension reported an increase in bone remodeling and gingival recession. Therefore, augmenting the facial aspect of implant sites is commonly performed using various materials, aiming to counteract the effect of the patient's anatomical factors mentioned above.

The presented cases displayed pleasing esthetic results after soft tissue augmentation procedures were performed using VSCM application. Similarly, in a study utilizing VSCM conducted by Huber et al, increased patient esthetic satisfaction scores were observed. In addition to stable esthetics, the restored buccal contour and healthy peri-implant tissue observed in the present study coincide with most of the results from previously conducted VSCM studies. Mucosal tissue augmentation has been consistently reported in those studies, and gingival recession has also been successfully treated using VSCM.

Neither patient developed adverse effects or major discomfort. Similarly, Schulze-Späte and Lee reported limited postoperative discomfort. Thoma et al reported less physical pain and a decrease in analgesic consumption together with decreased patient morbidity. Moreover, VSCM application can improve the tissue morphology, facilitating oral hygiene and providing a barrier to possible trauma.

The VSCM used in the presented cases is available in two sizes, both 6 mm thick. The present authors used untrimmed specimens when necessary; however, in a majority of instances, the material was trimmed down to a thickness of 3 to 4 mm prior to placement. This flexibility when adjusting the thickness has been found to be advantageous.

The material may be used in the surgical site either wet or dry, and the authors have used it in both modalities, often soaking it in leukocyte- and platelet-rich fibrin prior to placement, with no clinically significant difference. The material's potential ability to serve as a carrier for growth factors may be an area for future research.

Conclusions

Both presented cases had a short-term follow-up, approximately 12 months postrestoration. The lack of long-term human follow-up is a serious limitation, and the authors recommend careful deliberation when
choosing the augmentation material to use. Further research on the use of this soft tissue scaffold to augment buccal soft tissue contours is therefore needed.

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References


