Soft tissue augmentation:
Using collagen matrices around dental implants

Background

Surgical correction of soft tissues is often required during implant therapy for both functional and aesthetic reasons. Ridge augmentation with soft tissue can be necessary to achieve an aesthetically pleasing result and to rebuild the natural ridge contour, particularly during second-stage surgery. Autologous grafts from the palate, such as subepithelial connective tissue grafts (SCTG), are regarded as the current gold standard in these cases (Chambrone et al., 2010, Roccuzzo et al., 2002, Thoma et al., 2009, Esposito et al., 2012). However, it has been demonstrated that harvesting SCTGs might cause additional discomfort, because of secondary healing (Del Pizzo et al., 2002) and there can also be a risk of post-operative or intra-operative bleeding due to violation of the palatal artery, especially in shallow palates (Reiser et al., 1996). Therefore, a range of collagen matrices – mainly based on human or porcine dermis – have been designed and evaluated, both pre-clinically and clinically, to replace autologous grafts (Jung et al., 2004, Ghanaati et al., 2011, Richter et al., 2007, Nunez et al., 2009, Gapski et al., 2005). These offer several advantages, including unlimited availability, reduced morbidity and shorter treatment times. They need to be volume-stable for a certain period of time to serve as a scaffold for cell ingrowth and to allow vascularisation, and should ideally be replaced by the body’s own tissue without any foreign body reaction. Intactness/maintenance of the collagen structures, combined with porosity and absence of foreign material after tissue preparation, are crucial to the success and biocompatibility of these matrices. Potential shrinkage of the materials – especially when left exposed – is a potential major drawback.

Figures 1–3, taken using scanning electron microscopy, show the different composition of three different collagen matrices. Mucograft® (Figure 1: Geistlich Pharma AG, Wolhusen, Switzerland) is composed of collagen types I and III processed into a bi-layered matrix with one thin, low-porosity compact layer and one more porous three-dimensional spongy layer. Figure 2 (Mucoderm®; Botiss Dental, Zossen, Germany) shows a porcine acellular dermal matrix (ADM) without artificial cross-linking. Figure 3 (Derma®; Tecnoss Srl, Turin, Italy) is also a porcine ADM, but with a more dense layering of collagen fibres and hardly any pores. These differences in manufacturing and structure might lead to different possible indications and clinical behaviours. More clinical studies are needed to compare and to better understand the indications and behaviour of different soft tissue substitutes.

Clinical case

After submerged healing, a patient presented for second-stage surgery in the area of the upper left first premolar. The patient had a high smile line and major aesthetic concerns. As a result, it was decided to augment the buccal ridge volume during second-stage surgery (Figure 4). A porcine ADM (Derma®) was used due to its space-maintaining properties and slow adsorption kinetics. After split thickness flap preparation on the buccal aspect, the 2mm thick rehydrated matrix (5mm wide x 7mm long) was placed into the pouch to increase soft tissue volume and to build up the natural curvature (Figure 5). The flaps were adapted with double-sling sutures (6–0 Polypropylene; Figure 6). Twelve months after ridge augmentation, sufficient ridge volume had been achieved, providing pleasing aesthetic results as well as healthy peri-implant soft tissues (Figures 7 and 8).
References


