Soft tissue substitutes in dental implantology

Evaluating the role of collagen matrices and porcine dermal matrices

The predictability of osseointegration is no longer a challenge in dental implantology. Today the challenge for clinicians and researchers has shifted to the harmonious integration of the implant fixture into the neighbouring soft and hard tissue architecture. In the aesthetic critical zone, soft and hard tissue defects are often encountered due to pre-existing tissue defects or shrinkage of the ridge following tooth extraction.

The field of bone augmentation has evolved dramatically over recent decades and today xenogenous or allogeneic bone substitutes are widely used, either as a scientifically accepted alternative to autologous bone, or in combination with autologous bone.

In the field of soft tissue augmentation, soft tissue matrices are still fighting for their spot in the treatment armoury of experienced clinicians. Using autologous soft tissue grafts to correct deficiencies either at the time of implant placement, or at the second stage, is still regarded as the gold standard (Thoma et al., 2009). However, autologous grafts, routinely harvested from the palate, have certain disadvantages, such as second site morbidity; limited donor site availability; and risks of complications. These disadvantages have led to the development of soft tissue matrices to increase tissue volume or augment attached keratinised mucosa.

Different soft tissue matrices are now available, including acellular dermal matrices derived from human or porcine skin, and bilayer collagen matrices of porcine origin. Both can be used to improve tissue quantity and quality at different time points in dental implantology. Recent review articles point out that for recession coverage, scientific evidence for the efficacy of these materials is still low (Cairo et al., 2014). On the other hand, preclinical and clinical studies have clearly shown that ridge preservation with an autologous soft tissue punch can be regarded as the best technique for limiting post-extraction shrinkage (Fickl et al., 2008, Thalmair et al., 2013). However, tissue harvesting from the palate can be associated with disadvantages – in particular when punch grafts are removed – so porcine xenogenous matrices should be considered as an alternative. The amount of volume preservation achieved using a xenogenous bone substitute and a porcine matrix seems to be comparable with the use of an autologous punch and a xenogenous bone substitute (Jung et al., 2013). Therefore, in cases where a thick soft tissue complex is present, porcine collagen matrices can be used as an alternative to punch grafts. Figures 1–5 illustrate a clinical case where ridge preservation was performed using a xenogenous bone substitute (BioOss Collagen®) and a porcine collagen matrix (Mucograft Seal®).

Case 1: Ridge preservation with a bilayer collagen matrix

Scientific evidence from the last decade has clearly shown that ridge preservation techniques are able to limit tissue atrophy following tooth extraction (Ten Heggeler et al., 2011). Studies illustrate that the combination of a xenogenous bone substitute with an autologous soft tissue punch can be regarded as the best technique for limiting post-extraction shrinkage (Fickl et al., 2008, Thalmair et al., 2013). However, tissue harvesting from the palate can be associated with disadvantages – in particular when punch grafts are removed – so porcine xenogenous matrices should be considered as an alternative. The amount of volume preservation achieved using a xenogenous bone substitute and a porcine matrix seems to be comparable with the use of an autologous punch and a xenogenous bone substitute (Jung et al., 2013). Therefore, in cases where a thick soft tissue complex is present, porcine collagen matrices can be used as an alternative to punch grafts. Figures 1–5 illustrate a clinical case where ridge preservation was performed using a xenogenous bone substitute (BioOss Collagen®) and a porcine collagen matrix (Mucograft Seal®).

Case 2: Soft tissue matrices for volume augmentation at the time of implantation

Review articles clearly demonstrate that immediate implants are a viable treatment option – particularly in the aesthetic zone – providing a proper case selection is performed (Lin et al., 2014). Nevertheless, tissue shrinkage of approximately 1mm has to be expected following immediate implant placement (Clementini et al., 2015). Therefore, various studies and case series have advocated the use of subepithelial connective tissue grafts to compensate for these minor shrinkages (Lin et al., 2014). In this context, acellular dermal matrices could also help in increasing tissue volume at the time of implant placement. The scientific evidence for using dermal matrices at the time of immediate implant placement is still low; nevertheless, these materials seem to be useful for these indications. Fischer et al presented case reports and an ultrastructural
analysis of this material and concluded that its distinctive composition is ideal for submerged use (Fischer et al., 2014). Figures 6–10 show a case where an immediate implant placement was performed and an acellular dermal matrix (OsteoBiol® Derma) was used to increase tissue height and tissue volume.

**Case 3: Soft tissue matrices for volume augmentation at the second stage**

In many clinical situations, tissue defects are still visible at the second stage. Formerly, if these defects needed to be corrected, subepithelial connective tissue grafts were traditionally harvested to compensate for the volume defects. Dermal matrices could be an option to improve tissue quantity at this time in a more atraumatic way. Research data has shown that dermal matrices are replaced by connective tissue over a period of four months and integrate into the soft tissue without any foreign body reactions (Fickl et al., 2015). In particular, acellular dermal matrices seem to be indicated for these clinical situations as the post-operative shrinkage is rather low and they have to be used in a submerged environment. Figures 11–14 show a case where soft tissue augmentation was performed using a acellular dermal matrix (OsteoBiol® Derma) at the second stage.

**Summary**

Subepithelial connective tissue grafts and autologous punch grafts are still the gold standard for soft tissue augmentation, particularly when dealing with thin periodontal biotypes or large soft tissue defects. Nevertheless, soft tissue matrices can be a helpful way for the experienced clinician to reduce patient morbidity. Depending on the material and its composition, these products can be used for different indications. Collagen matrices are useful for ridge preservation procedures as they can be used in a non-submerged fashion. By contrast, porcine dermal matrices should be used for volume augmentation and submerged under the flap. If used properly, these materials can be a useful addition for every clinician. One important aspect of soft tissue xenografts is that their composition is consistent. This is not always the case with autologous grafts, which can include fatty and glandular components. In conclusion, early scientific evidence is encouraging, but long-term data still needs to be obtained before these materials should be used on a general basis.
## References


