

Ridge preservation/restoration using d-PTFE membranes

Part II: A protocol for using non-resorbable membranes immediately after extraction of teeth with advanced bone loss

The use of non-resorbable d-PTFE membranes in ridge preservation was first described by Bartee in 2001. Although this technique was presented around 17 years ago, it has not, in our opinion, received the attention it deserves. In the summer 2016 issue of *Inspired*, we described a protocol for using these kinds of non-resorbable membranes immediately after extraction. This follow-up article describes an additional application/indication for d-PTFE membranes: immediately after tooth extraction in cases involving advanced bone loss.

In our 2016 article, we outlined the reasons why d-PTFE membranes are required for this technique: they are non-permeable to bacteria, and as a result retain their functionality when they are exposed to the oral cavity. This was recently demonstrated in a study in which histological data showed that directly after membrane removal no endothelial cells or bacterial contamination was present (Laurito et al. 2016). Four to five months after membrane removal, histological data showed the formation of mainly newly formed bone (Hoffmann et al. 2008). Another advantage associated with d-PTFE membranes is the increased width of keratinised tissue which can be gained during the healing process (Barboza et al. 2014).

The original technique described in 2001 was called 'extraction site reconstruction for alveolar ridge preservation, membrane-assisted surgical technique,' and it included the use non-titanium-reinforced d-PTFE membranes. In our practice, however, we have been applying titanium-reinforced d-PTFE

membranes (Cytoplast, Osteogenics Biomedical) immediately after tooth extractions where there has been advanced bone loss. The results from this approach have consistently been fascinating.

By using titanium-reinforced membranes in cases involving advanced bone loss, we have been able to expand the indications of Bartee's original technique. In retrospect, it may be more suitable to describe the technique as 'immediate augmentation and ridge preservation following extraction including increasing the amount of keratinised tissue.' The following two cases illustrate the potential benefits of this technique when used with titanium-reinforced d-PTFE membranes.

Case 1

The patient's tooth 16 had to be extracted due to: deep caries; widened periodontal ligament space; partial endodontic root treatment; a class II furcation involvement on the buccal and mesial aspect; and a 4mm buccal recession (Figure 1). According to our assessment, if tooth 16 was extracted using conventional means, a sinus lift would later be required before an implant could be placed.

We decided to perform immediate augmentation and ridge preservation after extraction and use a titanium-reinforced d-PTFE membrane (as tooth 16 showed advanced bone loss). The reinforced membrane would provide the necessary stability for guided bone regeneration (GBR) in the area.



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Figure 1



Figure 2

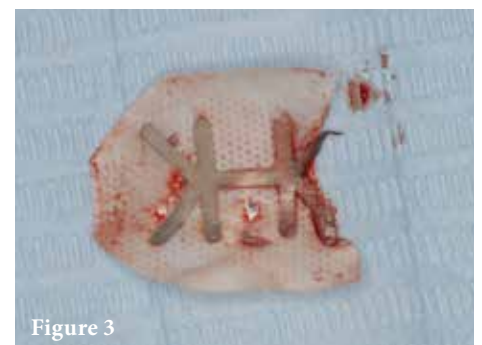


Figure 3



Figure 4



Figure 5

Figure 1. X-ray image of tooth 16.

Figure 2. Clinical picture four weeks after extraction and membrane placement.

Figure 3. The membrane after removal.

Figure 4. Clinical picture directly after membrane removal. Note that resorbable sutures have been applied to stabilise the wound edges.

Figure 5. The same area three months after membrane removal. Note the widened zone of keratinised tissue.

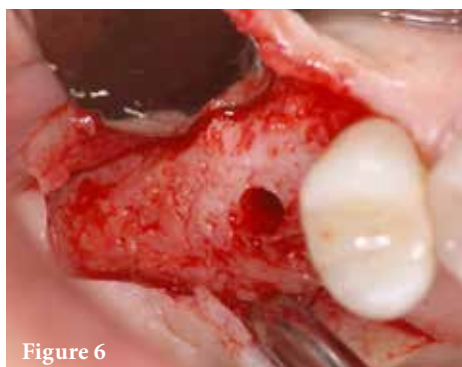


Figure 6



Figure 7



Figure 8



Figure 9



Figure 10

Figure 6. Clinical picture after implant bed preparation.

Figure 7. Clinical picture after implant placement.

Figure 8. Crown placement.

Figure 9. X-ray image after crown placement.

Figure 10. Clinical view two years after crown placement.

Tooth 16 was extracted with as little trauma as possible; the alveolus was carefully cleaned and all granulation was removed. A small buccal flap was elevated with a vertical incision in the region of tooth 17. This provided better access, as the area was also going to be augmented. Because the membrane was being placed between the existing bone walls and tissue, we prepared an 'envelope' around the alveolus using a small elevator or papilla-lifting instrument. The alveolus, and a part of the area around 17, was filled with an allogeneic bone graft material which could be mixed with a xenograft. The GBR area was then covered with a titanium-reinforced d-PTFE membrane which had been trimmed to the desired size.

During placement, care was taken that the membrane be bent in the desired shape (as this dictates where the bone will regenerate). We returned the buccal flap to its original location and sutured the tissues. Our main goal here was to stabilise the tissues and membrane. The wound margins were sutured using a combination of horizontal mattress sutures, single and cross sutures. We made sure that the edges of the membrane were not in contact with the neighbouring tooth and that they were covered with soft tissue. Post-operative instructions included no mechanical cleaning of the area and rinsing twice a day with chlorhexidine.

At this point, it is important to stress that the tissues should not be closed primarily, and a

horizontal releasing incision should not be made in the buccal flap. The reason for this is that the mucogingival junction should be left in its original position.

After one month we removed the membrane and found that tissue healing had been uneventful (Figures 2–4). Since a part of the area around tooth 17 had also been restored, a larger membrane (20 x 25mm) was used (Figure 3). Following membrane removal, the newly-formed osteoid matrix was clearly visible and resorbable sutures were applied to stabilise the wound edges (Figure 4). There was no need to cover the newly-formed osteoid matrix as the matrix follows the normal healing pattern.

Three months later, the clinical pictures showed a widened zone of keratinised tissue and alveolar ridge preservation/restoration (Figure 5). The implant was placed and when the implant bed was being prepared, hard regenerated bone was noticed. The sharp edges of the marginal bone after implant bed preparation illustrate the hardness of the regenerated bone (Figures 6 and 7). An 8mm implant was placed without perforating the sinus; three months later the crown was placed (Figure 8). An x-ray taken after crown placement shows a stable and more favourable bone situation than the initial situation (compare Figures 1 and 9). The clinical picture taken two years after crown placement shows a stable situation (Figure 10).



Figure 11



Figure 12



Figure 13



Figure 14



Figure 15

Figure 11. X-ray image of molar 16 and 17.

Figures 12–14. Clinical picture before and after extraction of both molars.

Figure 15. Trimmed d-PTFE membrane before placement.

Case 2

The second clinical case involves two molars which had to be extracted because of advanced periodontal attachment loss combined with a fistula at 17 and caries at 16 (Figures 11–13). A flap was elevated, after which both molars were extracted in a minimally traumatic way. The alveoli were carefully cleaned and all granulation was removed (Figure 14). Due to the extent of bone destruction and size of the defects, a large titanium-reinforced d-PTFE membrane (25 x 30mm) was selected and trimmed with scissors (Figure 15). The membrane was bent with surgical tweezers into the desired shape.

The 2.5 cc allogeneic bone graft material was placed in the alveoli to act as filler material and covered with the membrane. Next, stabilising sutures were used (Figures 16–18). The wound margins were sutured using a combination of horizontal mattress sutures, single and cross sutures. Again, it must be emphasised we deliberately did not primarily close the wound edges. Although the protocol for conventional extraction involves closing wound margins if possible, primary closure is unsuitable for this technique (Figure 18).

After four to five weeks the tissue healing was uneventful (Figure 19). The membrane was removed, after which the newly formed osteoid matrix was visible (Figure 20). From the initial clinical view, it can be difficult to envisage the final result. However, we know from one study (Hoffmann et al. 2008) that epithelialisation is usually complete after four weeks and the formed osteoid matrix will change into alveolar bone over time.

Five months after extraction and placement of the membrane, a wide zone of keratinised tissue was visible (Figure 21). The CBCT image demonstrated the level of ridge preservation and restoration which

had been achieved (compare Figures 11 and 22–23). At the time of implant placement, a somewhat irregular bone surface was visible as the allogeneic graft material consisted entirely of cortical bone parts (Figure 24). The tissues were thickened with a connective tissue graft taken from the tuberosity to achieve the required peri-implant tissue thickness (Figure 25). After a healing period was observed, the crowns were placed (Figures 26 and 27). The x-ray taken at that time clearly showed the ridge preservation, but also highlighted the degree of ridge restoration which had been achieved, especially when compared with the x-ray taken before extraction of both molars (compare Figures 11 and 27).

Conclusion

Using a titanium-reinforced d-PTFE membrane immediately after extraction of teeth with advanced bone loss is a valuable technique with promising results which have been clinically demonstrated. When incorporated into a suitable treatment plan, the technique can make implant placement easier and more predictable. It also considerably increases the likelihood that no additional bone augmentation procedures will be required (including sinus lifts) at the time of implant placement.

d-PTFE membranes can preserve the shape of the alveolar ridge and increase the amount of keratinised gingiva. Moreover, they are capable of restoring severely damaged ridges to a high degree, even in compromised situations. However, the use of this technique in acutely infected sites is not recommended.

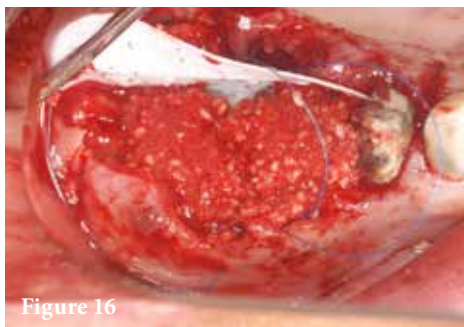


Figure 16

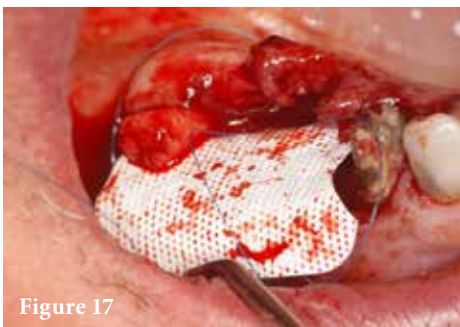


Figure 17



Figure 18



Figure 19



Figure 20



Figure 21



Figure 22



Figure 23

Figures 16–18. Clinical picture at time of membrane placement and after suturing.

Figures 19–20. Clinical view five weeks after membrane placement and directly after removal.

Figure 21. Four months after membrane removal the tissues have healed nicely and a widened zone of keratinised tissue is visible.

Figures 22–23. CBCT image of the area, five months after membrane placement, showing the amount of bone gain when compared to Figure 11.



Figure 24

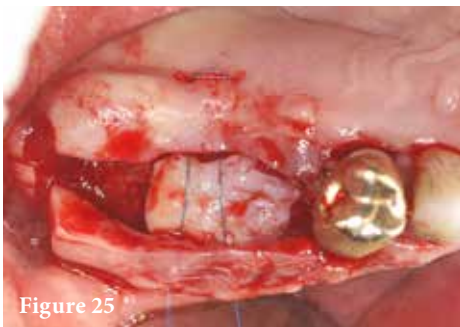


Figure 25



Figure 26

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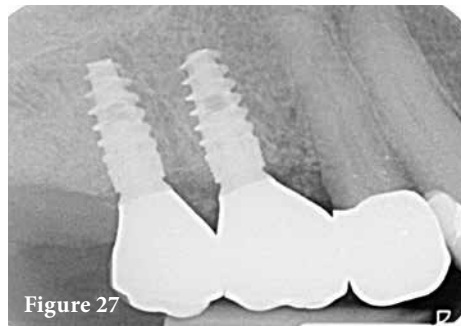


Figure 27

Figures 24–25. Clinical picture after implant placement. A connective tissue graft is used to thicken the tissue around the future abutments.

Figure 26. Clinical view after crowns placement.

Figure 27. X-ray after crowns placement. Compare with Figure 11 to note the bone gain.