

Treatment of a dehiscence-type defect around a dental implant with a biodegradable membrane

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Summary

This case report describes the treatment of a dehiscence-type alveolar bone defect around a dental implant with GBR (guided bone regeneration) where Straumann® MembraGel is used as a biodegradable barrier. This membrane simplifies clinical handling compared to conventional membranes because it is applied as a liquid.¹ After application, the membrane solidifies within 20 – 50 seconds. This effectively stabilizes the bone graft, in order to provide stable bone and peri-implant soft tissue conditions with a completely restored emergence profile around the dental implant.

Introduction

Alveolar bone defects in the jaw can be successfully treated using GBR techniques. The idea behind this treatment method is to use a resorbable or non-resorbable barrier to prevent ingrowth of proliferating connective or soft tissue cells into the hard tissue defect and to create a space for

bone tissue-derived cells to grow.^{2,3} Barrier membranes can be manufactured from various natural or synthetic precursors. Today, the most frequently used resorbable membranes in dentistry are made of collagen.^{4,5,6,7,8} These membranes are available in standard sizes and forms and need to be adapted to the patient's individual situation before or during use. The availability of a biodegradable membrane which can be customized in-situ for each individual defect thus offers an improvement for GBR procedures. Recently, a novel PEG-derived (polyethylene glycol) membrane for use with GBR indications has become available on the European and North-American markets. After activation by mixing the four different precursors, the membrane is applied as liquid and forms a hydrogel within a few seconds after being applied. The membrane undergoes hydrolytic degradation during the healing period. PEG has been shown to be biocompatible⁹ and has been studied in other medical disciplines in the past, for example, as a sprayable adhesion barrier^{10,11} and in neurosurgery.¹² Several preclinical studies using different animal models have



Figure 1.



Figure 2.



Figure 3.

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Figure 4.

been conducted to evaluate the effectiveness of the membrane as barrier membrane in GBR procedures.^{13,14,15} First clinical data is available as well.¹ Because Straumann® MembraGel represents a completely new technology for usage in GBR procedures the surgical protocol for the augmentation procedure has to be modified slightly over that of conventional membranes. This case report illustrates a feasible treatment protocol for this new-membrane technology in the treatment of alveolar bone dehiscence around a bone level dental implant in combination with bone graft substitute material.

Patient history

The patient (female, 52 years at time of implant surgery, overall in good health, non-smoker) had been treated for chronic periodontitis and undergone maintenance therapy since 1994 (Figure 1). Due to pulp necrosis resulting from caries, tooth #41 was treated endodontically in 1997. Because of periapical periodontitis, an apicoectomy was performed. Due to recurring CAP, tooth #41 had to be extracted in 2009 (Figures 2, 3).

Initial situation

Due to the limited prognoses for a second apicoectomy, the proposed prosthetic solution for the patient was an implant-supported single crown. The patient agreed after having been informed about the prognostic factors and risks. During wound healing after tooth extraction, typical horizontal and vertical alveolar bone loss was found at position #41. For this reason, prior to the planned implant insertion, a ridge augmentation was performed using bovine-derived xenograft and a collagen membrane (in January 2010).⁷ In November 2010, the patient was scheduled to undergo implant insertion (bone level) with a simultaneous augmentation of the alveolar ridge dehiscence located on the coronal section to ensure a stable morphologic reconstruction of the alveolar region. For the

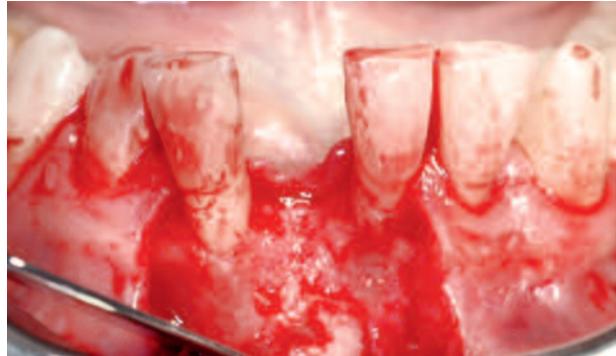


Figure 5.

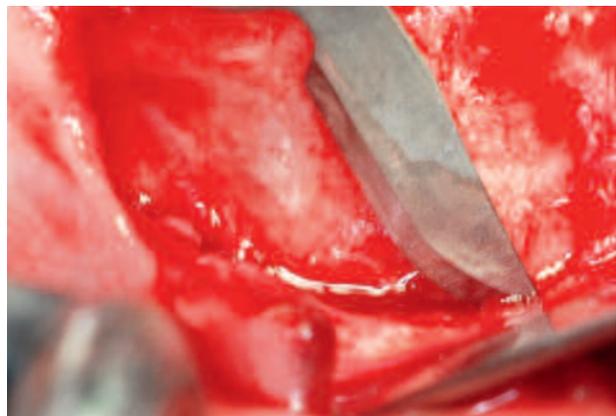


Figure 6.

esthetic outcome in this case, this was important because the patient's lower gums were visible when she speaks.

Surgical procedure

No antibiotics were used preoperatively since the patient underwent periodontal care and preoperative testing for the prevalence of periopathogenic microbiota, with no indications of the MO above the detection limit. The surgery was performed under local anesthesia. The horizontal incision was made with a slightly lingual aspect, with two vertical releasing incisions, each 1 tooth distant in the mesial and distal aspect of region #41. A full mucoperiosteal flap was raised. This flap shape was chosen to achieve sufficient access and visibility to the treatment site and to ensure optimal blood support after primary closure (Figures 4, 5). The implant site was prepared according to the standard protocol recommended by the manufacturer (Figure 6). Immediately after preparing the site, the periosteum-releasing incision was made to achieve a tension-free closure of the GBR site later, which then prevents heavy bleeding at time of membrane placement (Figure 7). After the placement of the bone level implant, a dehiscence-type alveolar bone defect of approx. 4 mm was present. The defect was



Figure 7.



Figure 8.



Figure 9.



Figure 10.

augmented with bone graft substitute material which was slightly rehydrated in physiological saline prior to use. Overbuilding was avoided during augmentation procedure. In order to optimize the attachment of Straumann® MembraGel to the recipient site, the host bone and the grafting material was dried with sterile gauze immediately before application.

The activated Straumann® MembraGel was applied to the defect site. Next, 1-1.5 mm of the augmented area was outlined and covered successively with the bone substitute material. In the crestal aspect, the membrane was placed by covering no more than approx. 1/3 of the implant screw surface. Complete coverage of the cover screw was avoided. Care was taken to ensure that only a thin membrane layer was applied during the procedure (Figures 8, 9).

After application, the membrane sets in situ by gelation within 20 - 50 seconds. No further fixation of the membrane is necessary, as the gel adheres sufficiently to the surrounding host bone. Healing was attempted with the

implant in a submerged position after tension-free closure of the released mucoperiosteal flap. The wound was closed with interrupted sutures made of a PvDF monofilament material (7-0, Figure 10).

Postoperative treatment

The patient was instructed to rinse four times daily with a prepared aqueous 0.12% chlorhexidine solution. No analgesics had to be prescribed. The patient was informed that NSAIDs could be used if necessary. The patient was also instructed to refrain from mechanical plaque removal in the area of surgery until time of suture removal. She had been provided with a small removable prosthesis pre-operatively for esthetic purposes. Care was taken to ensure the "dental flipper" did not apply any pressure to the wound, and the patient was instructed to remove the flipper while sleeping.

After an unproblematic initial healing period (Figure 11), the sutures were removed 10 days after the implantation operation.

The subsequent healing period was also normal (Figures



Figure 11.



Figure 12.



Figure 13.



Figure 14.



Figure 15.



Figure 16.



Figure 17.

12, 13). The soft tissue healing abutment was installed 4.5 months following the operation. The final restoration was completed 6 weeks later (Figure 14). The FPD was designed as a cemented alloy-ceramic crown on a custom-made abutment.

The post-op clinical and radiological evaluation at 47 weeks exhibited stable bone and peri-implant soft tissue conditions (Figure 15) with a fully restored emergence profile, particularly in the horizontal aspect (Figures 16, 17).

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