

# A Modification to Schneiderian Membrane Perforation Repair Technique: The Hammock Approach

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## INTRODUCTION

**M**axillary sinus elevation procedures are widely used in oral surgery and implant dentistry in those cases with insufficient bone height resulting from bone atrophy and pneumatized maxillary sinuses, which precludes dental implant insertion.<sup>1</sup>

Sinus augmentation therapy generates sufficient bone height to enable the placement of posterior maxillary implants and, since its introduction by Boyne and James,<sup>2</sup> has proved a highly predictable procedure.

The most common complication involved in sinus elevation augmentation is membrane perforation. The incidence of this event ranges from 10%–56%.<sup>3</sup>

The use of collagen membranes for sealing sinus perforations has been shown to be a predictable method for managing these complications.<sup>4</sup> The classic mode uses a resorbable collagen membrane as a new wall, enabling accurate placement of the regeneration material and avoiding the displacement of the graft particles into the sinus cavity.<sup>5</sup>

In this context, we planned to devise a modification to the Loma Linda pouch technique described by Proussaefs and Lozada.<sup>3</sup> This “hammock” approach immobilizes the collagen membrane as far as possible, promotes greater blood supply, thereby increasing vital bone formation.

## CASE PRESENTATION: THE HAMMOCK APPROACH

When perforation occurs during elevation of the Schneiderian membrane, elevation of the membrane from the internal sinus walls must be completed (Figure 1).

Once the final regenerating cavity has been prepared, 2

horizontal perforations are made, using a lance-shaped drill bur, through the palatal mucosa reaching the palatal sinus wall surpassing it up to the cavity. These perforations must be made over the height required for placing the future dental implants. Afterwards, the 2 corresponding horizontal perforations are made in the buccal sinus wall above the lateral window created for sinus lift procedure (Figures 2 and 3).

A resorbable collagen membrane is prepared (Jason; Botiss Biomaterials, Zossen, Germany) by making 2 perforations at its narrowest side with a nonresorbable 4/0 sheathed polyamide 6/6 suture. The first perforation is made in one of the corners, and the second one is made in the opposite corner but in the reverse direction.

Then, inside the prepared sinus cavity, the nonresorbable suture needle is passed from the cavity through one of the palatal perforations, and the tail end is passed in the same way through the other palatal perforation. In this way, the collagen membrane can be pulled from the palate into the cavity and then stabilized by knotting the suture in the palatal mucosa (Figures 4 and 5).

Once the collagen membrane is sutured on the palatal side, it is placed as a new ceiling of the regenerating cavity (Figure 6). The collagen membrane is doubly perforated in the same way as the opposite side but using a resorbable 4/0 polyglactin 910 suture (Vicryl; Ethicon US, Cincinnati, Ohio). After that, a resorbable suture is used to affix the membrane to the buccal sinus wall perforations (Figures 7 and 8).

Thereafter, the regenerating cavity is filled with the chosen graft material with the safety and certainty that graft particles cannot enter the residual sinus cavity (Figure 9). In this approach, plasma rich in growth factors is used as a graft carrier to achieve a more compact and homogeneous bone graft and to avoid particle dispersion.

The rest of the procedure follows the classic sinus augmentation approach (Figure 10).

## DISCUSSION

Ranges of techniques have been proposed for handling this type of perforation, such as the use of collagen membranes, bone sheets, fibrin sealants, and connective tissue.<sup>5</sup> Most of

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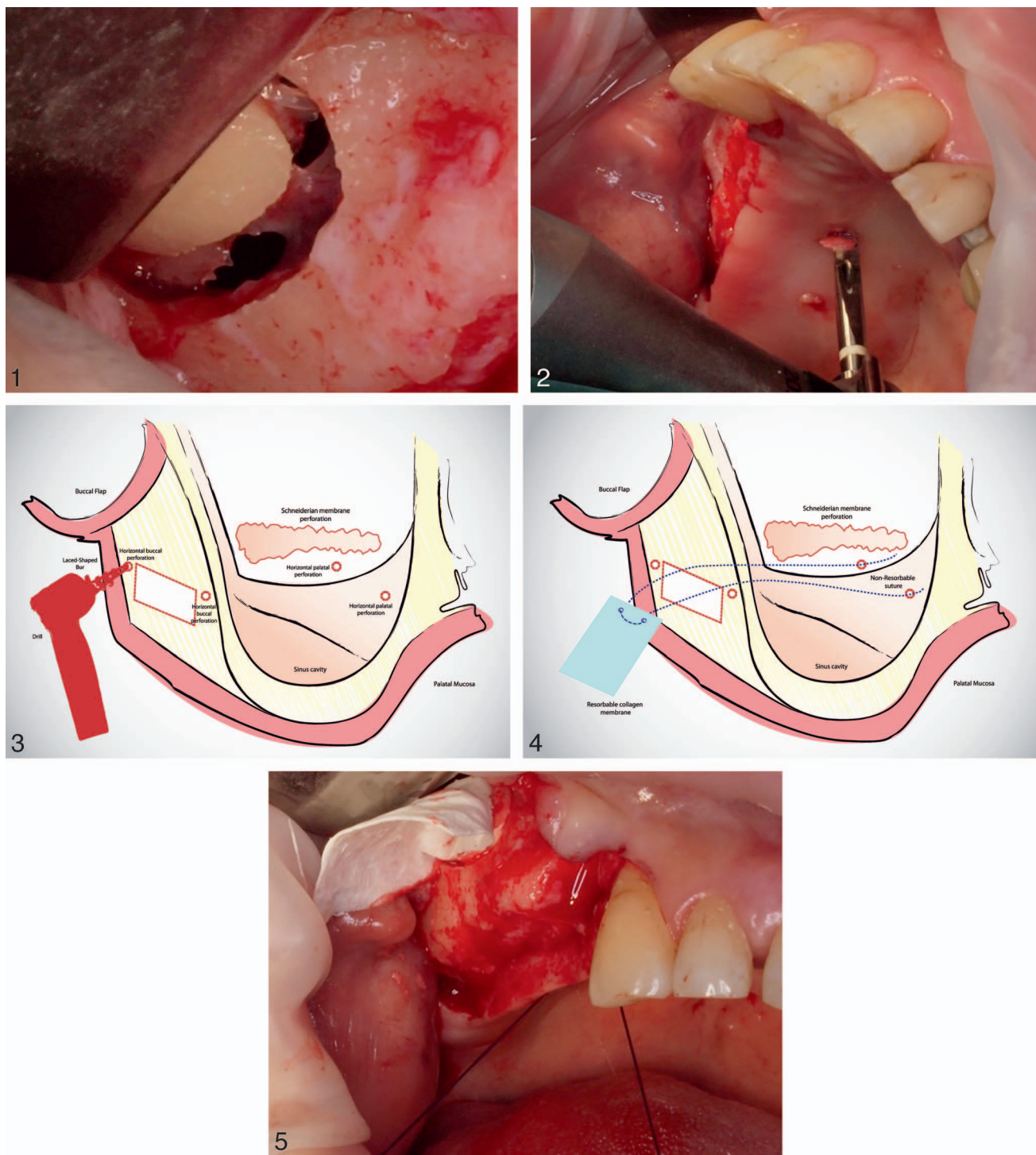
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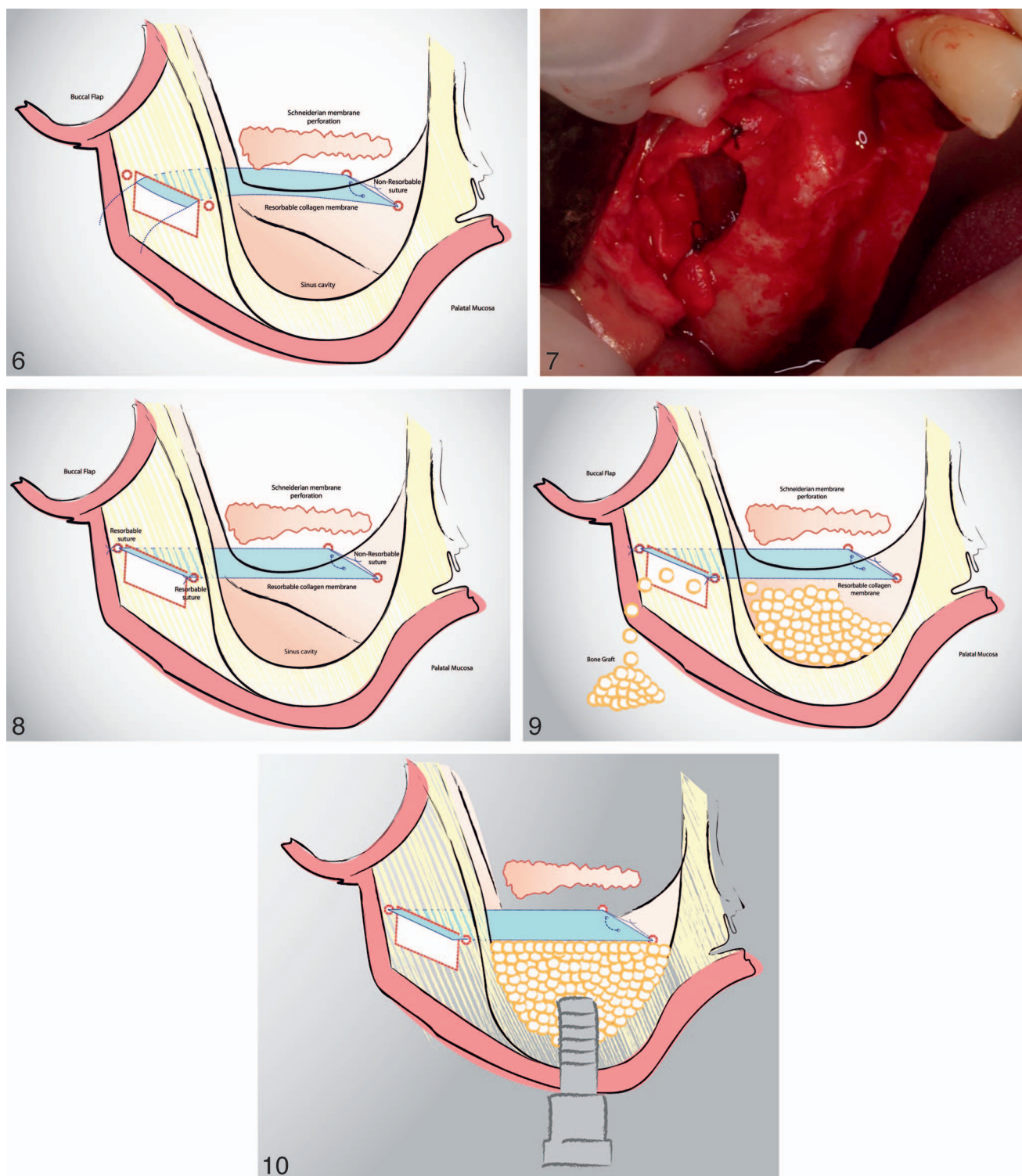
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**FIGURES 1–5.** **FIGURE 1.** Schneiderian membrane perforation. **FIGURE 2.** Horizontal perforations through palatal mucosa. **FIGURE 3.** Horizontal perforations through buccal sinus wall. **FIGURES 4 AND 5.** Pulling the collagen membrane from the palatal perforations into the cavity, thanks to the nonresorbable suture.

these techniques involve repairing perforations that range in size from 2 mm to 1.5 cm. For larger perforations ( $>1.5$  cm), the only reported possibility is the use of a resorbable collagen membrane.

Displacement of the collagen membrane is one of the most frequent complications when carrying out this technique, allowing graft particles to migrate into the sinus cavity, thereby leading to the failure of the procedure. For



**FIGURES 6–10.** **FIGURE 6.** Collagen membrane placed as a new ceiling of the regenerating cavity. **FIGURE 7.** Final fixation and immobilization of the collagen membrane in the buccal site with resorbable suture. **FIGURE 8.** Resorbable collagen membrane placement sutured to a double perforation of the buccal sinus wall and palatal mucosa and sinus wall. **FIGURES 9 AND 10.** Sinus cavity filling with the chosen bone graft.

this reason, perfect immobilization of the membrane is the key to success.<sup>3</sup>

Compared with other methods, this modified approach enhances the fixation of the collagen membrane—not only on the buccal side but also on the palatal side of the sinus

cavity. This achieves stable immobilization of the collagen membrane and, with it, better treatment predictability.<sup>4,5</sup>

In addition, the resorbable collagen membrane does not cover the medial wall of the maxillary sinus, increasing blood supply to the graft.<sup>5</sup>

#### NOTE

The authors report no conflicts of interest.

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