Flapless Implantology

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Preface

Flapless implant surgery is thought by many to be a procedure with many limitations, including the inability to save the keratinized mucosa because a tissue punch removes some of this tissue; a lack of proper drilling depth assessment as it is difficult to see lines on the drill at the bone crest; an inability to assess the location of the implant because there is no direct visualization of the bone; and an inability to correct peri-implant defects as they are not exposed during surgery. As a result, guidelines on the flapless procedure were that it should be used only when the bone has abundant width and when the soft tissue has sufficient amounts of keratinized mucosa. Based on these guidelines, there are few cases in which the flapless procedure can be applied.

There are two ways to view flapless implant surgery, either as having possibilities or as possessing limitations. This book shows how to overcome the limitations and how to take advantage of its extraordinary benefits. Flapless implant surgery has numerous advantages, including the preservation of circulation, soft tissue architecture, and hard tissue volume at the site, decreased surgical time, improved patient comfort, and accelerated recuperation. This book shows definitive outcomes and scientific proof of the efficacy of flapless implant surgery as well as the best techniques necessary to obtain its greatest benefits. It also addresses the application of flapless implant surgery to a variety of clinical situations and includes specific techniques for the management of challenging cases. A final chapter focuses on flapless implant surgery for specific implant systems.

Practical information is provided for the reader who wishes to learn flapless implant surgery. We sincerely hope it will serve as a useful fund of knowledge as well as a guide for those who are interested in flapless implant surgery. Finally, I would like to thank Quintessence Publishing for recognizing the value of flapless implant surgery and the need for a book on its clinical applications.

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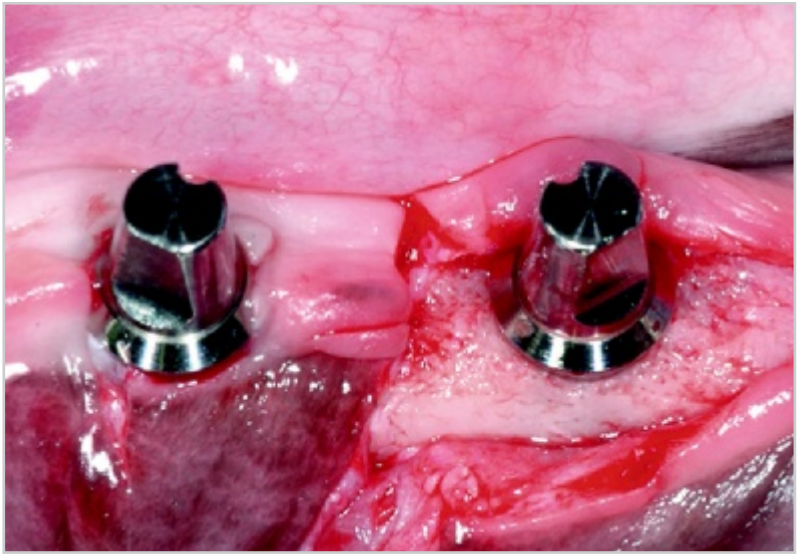
CHAPTER

1

Comparison of Flap and Flapless Implant Surgeries



Key point

Flap elevation on the alveolar crest can have a butterfly effect in implant treatment.

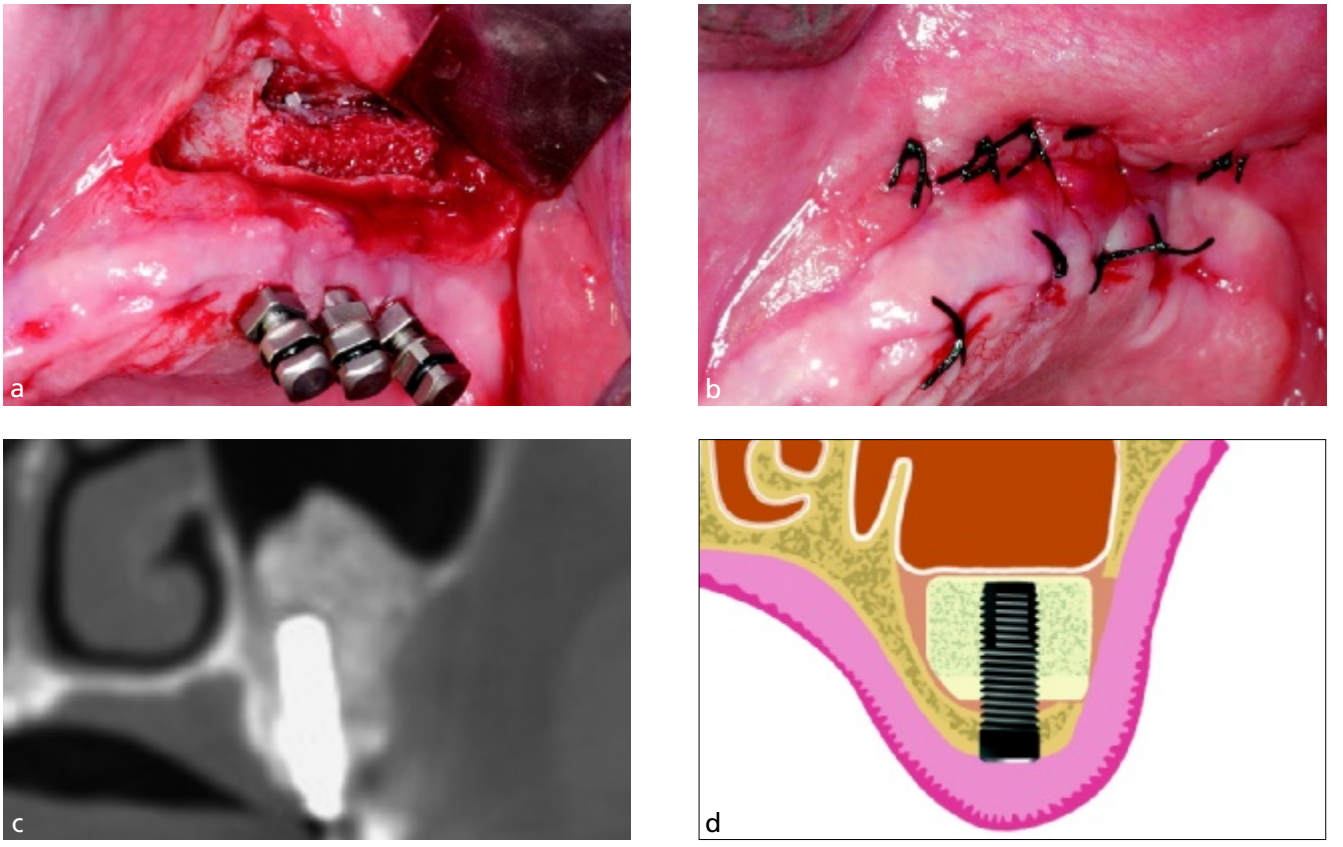


Fig 4-36 (a) Block autogenous iliac bone grafting and simultaneous mini-incision implant placement. (b) Intraoral view immediately after surgery. (c) Postoperative radiographs after 6 months. (d) Illustration of block bone grafting and simultaneous mini-incision implant placement.

mutual graft–implant stability, which facilitates simultaneous implant placement in the posterior atrophic maxilla. When a Bio-Oss® block is required, this is so brittle and weak that it cannot provide sufficient mechanical force for the primary stability of implants. Accordingly, when the remaining bone cannot ensure the primary stability of the implants, flapless implant placement into the Bio-Oss® block should be delayed for 6–10 months.

Guidelines on the selection of technique for flapless implants

The choice of a soft tissue punch technique or a mini-incision technique is dependent on bone quality and primary implant stability. The following guidelines are intended to help clinicians to make the best choice (Fig 4-37).

Guideline 1: Select the soft tissue punch technique for a one-stage approach

The soft tissue punch technique is used for a one-stage surgical approach, whereas the mini-incision technique is used for either a one-stage or a two-stage surgical approach. The two-stage surgical process places the implant body below the soft tissue until bone healing has occurred. It is prudent to use the two-stage surgical approach when implants are not adequately stabilized or if the patient wears a soft tissue-borne partial denture.

Guideline 2: The mini-incision technique is preferred in areas with insufficient amounts of keratinized mucosa

The amount of keratinized tissue should be adequate, and ideally patients need at least 1.5 mm of keratinized tissue to the facial aspect of the healing abutment. The mini-incision technique is beneficial in saving the keratinized mucosa. Therefore, the soft tissue punch technique must be used in cases where at least 1.5 mm of keratinized tissue is left on the buccal side to this incision line of the punch.

Guideline 3: Select the mini-incision technique in the posterior maxilla

On rare occasions, an implant in the maxilla may not remain rigid after implant placement.[10] A nonsubmerged, mobile implant may not heal predictably with a direct

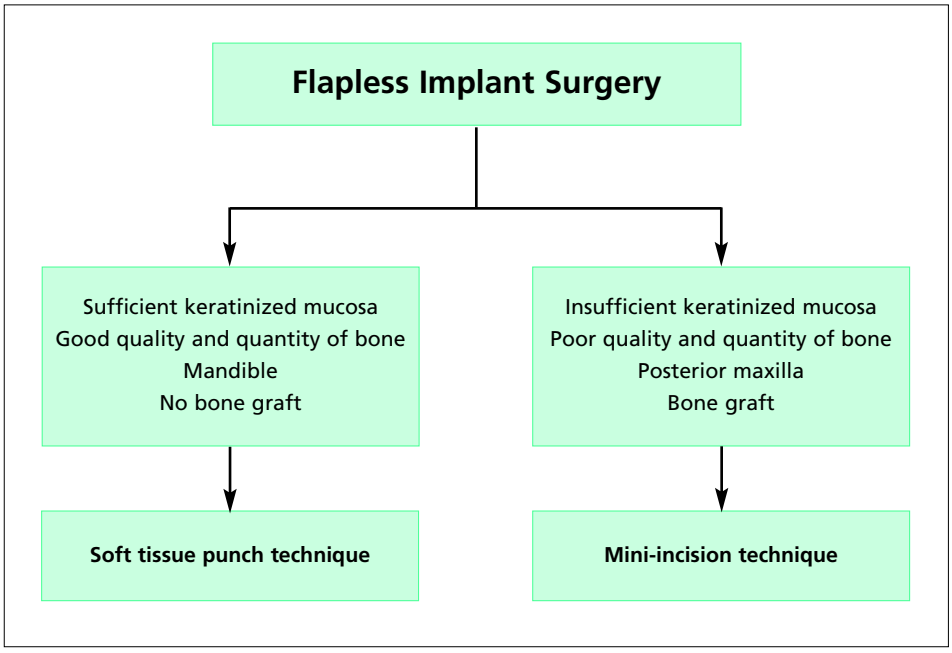


Fig 4-37 Choice of a soft tissue punch technique or a mini-incision technique is dependent on bone quality and primary implant stability.

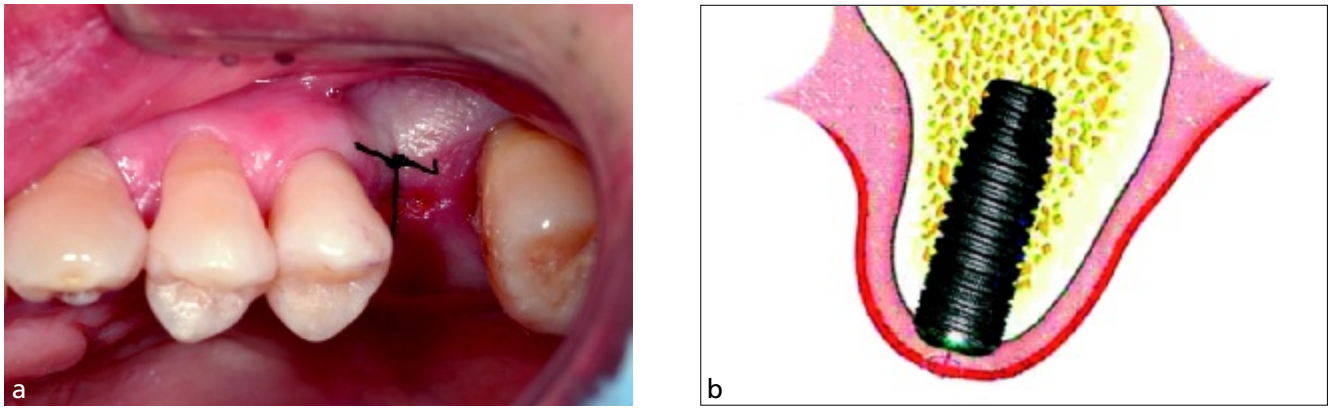


Fig 4-38 (a and b) On rare occasions, the implant in the maxilla may not be rigid after implant placement. Any implant that is not adequately stabilized should be submerged during healing, which reduces the risk of micromovement and early implant failure. Therefore, the mini-incision technique is selected in the maxilla to place the implant body below the soft tissue.

bone interface. Any implant that is not adequately stabilized should be submerged during healing, which reduces the risk of micromovement and early implant failure. Therefore, the mini-incision technique is selected for implants in the posterior maxilla in order to place the implant body below the soft tissue (Fig 4-38). The mini-incision technique is the best approach in the posterior maxilla where deficient osseous structures and an absence of a cortical plate on the crest of the ridge further compromise the initial implant stability at the time of insertion.[11]

Guideline 4: In the mandible, a one-stage approach offers more advantages

The most common complication of a two-stage approach in the mandible is the risk of fistulas or gumboils, which can develop in the mucosa covering the cover screws, because the mandible contains thick cortical bone,[12-14] thin mucosa,[15] and a 1–2 mm wide avascular zone in the crestal area of the edentulous alveolar ridge[16] (Figs 4-39 to 4-41). Fistulas or gumboils that develop in the mandible are dangerous because they can destroy bone (Fig 4-42). Therefore, when the implant is threaded into position with 20 Ncm or more, a one-stage approach is used in the mandible (Fig 4-43). This approach eliminates the risk of postoperative infection and allows the peri-implant soft tissue to be mature at the time of implant placement. When an implant in the mandible is not rigid after implant placement, the implant should be submerged. Periodic, meticulous observation is necessary to check for the formation of a gumboil or fistula.

Overview

Stage II surgery is necessary to uncover implants when they are submerged using a mini-incision technique. A clear understanding of the advantages of the flapless procedure also includes its application in stage II surgery. This chapter addresses stage II surgery using the flapless technique.

Challenges for the flapless technique in stage II surgery, and solutions

Misch[1] recommended reflection of a full-thickness flap for stage II surgery to identify and correct any bone defects around an implant, to reposition keratinized tissue, and to decrease the amount of thick mucosa. However, the necessity of using flap reflection in stage II surgery appears to be questionable after flapless implant placement, based on the following considerations.

Identifying and correcting peri-implant bone defects

Peri-implant defects can be identified without flap elevation. Radiographs are used to closely evaluate the crestal, mesial, and distal bone–implant interfaces before the stage II uncovering procedure. Probing is used to evaluate the facial and palatal conditions. Reflection of a full-thickness flap is unnecessary to identify these defects.

In animal and clinical studies by the authors, there was little or no crestal bone loss identified at stage II uncovering after the mini-incision submerged procedure (Figs 7-1 and 7-2). Indeed, there were no bony defects around the mini-incision submerged implants that required treatment

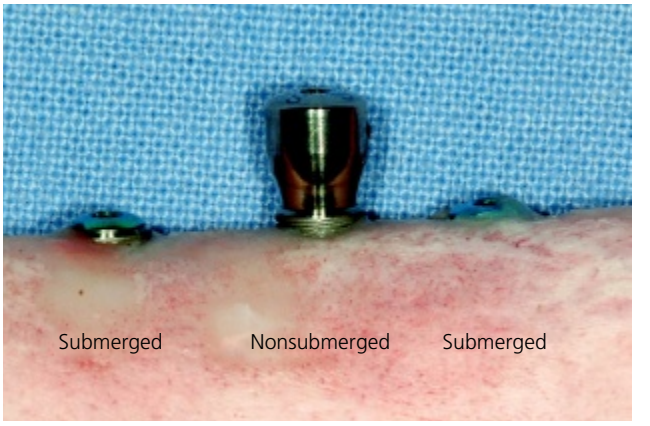


Fig 7-1 Mini-incision submerged implant (left); soft tissue punch nonsubmerged implant (middle); mini-incision submerged implant (right). There is no crestal bone loss at stage II uncovering after mini-incision submerged implant placement.

(Fig 7-3). Therefore, there is no need to reflect a mucoperiosteal flap in order to identify a defect after the mini-incision submerged procedure. It should be noted that additional surgery can lead to additional bone loss when a full-thickness flap is reflected. If a bone defect around the implant at stage II uncovering requires a bone graft, it can instead be reconstructed using a subperiosteal tunneling procedure (Fig 7-4). This procedure is described in Chapter 12.

Repositioning of the keratinized tissue

Although keratinized tissue cannot be repositioned without flap elevation, it can be saved using a mini-incision technique. Conflicting results regarding the necessity of having keratinized mucosa around implants have been reported. Krekeler et al.[2] suggested that implants placed in keratinized gingiva had a more stable interface between the

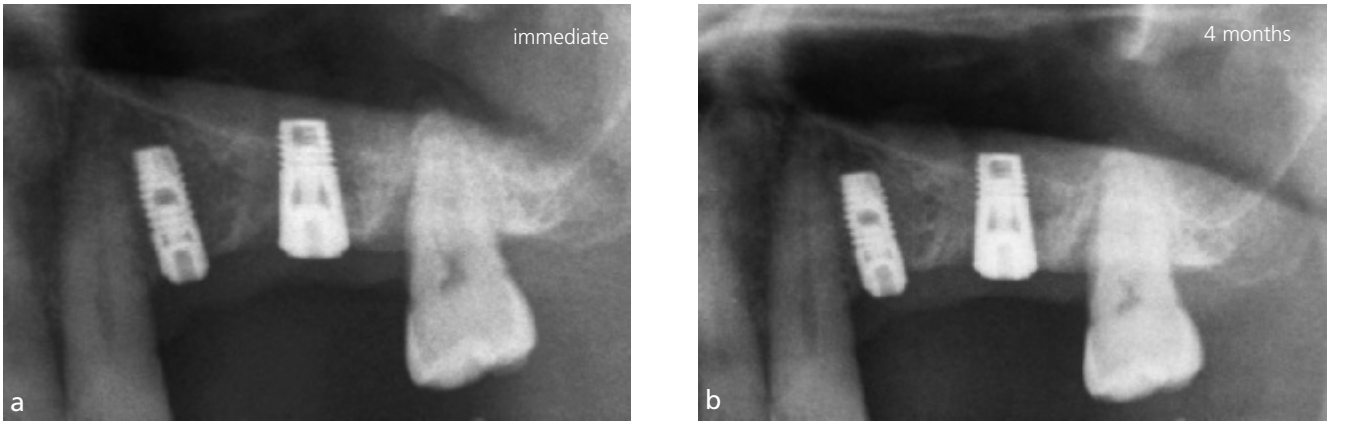


Fig 7-2 In a patient who underwent the mini-incision submerged implant placement, there is no crestal bone loss at stage II uncovering: (a) immediately after the implant placement; (b) 4 months later.

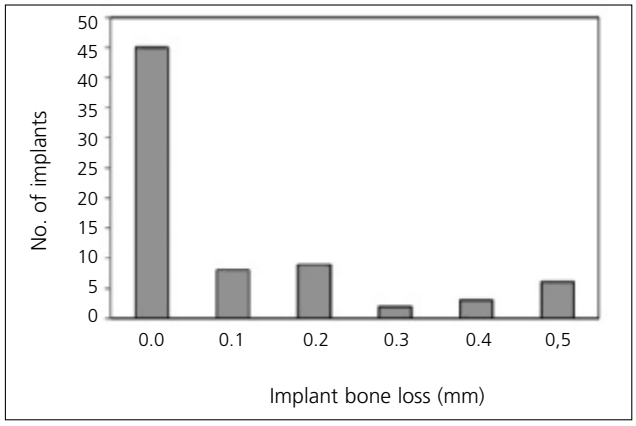


Fig 7-3 Bar chart showing the implants that exhibit varying amounts of bone loss during the healing period after first-stage surgery using the mini-incision submerged procedure.

soft tissue and implant than did implants in the movable soft gingiva, and the latter were more likely to cause soft tissue problems such as infection. However, the presence or absence of a zone of keratinized gingiva around implants remains a controversial issue.[3–6] Several reports have demonstrated long-term implant survival in the absence of keratinized tissue.[5–7] They suggest that keratinized tissue is not essential for the success of an implant. The necessity of keratinized tissue around flapless implants should be reevaluated.

Following flapless implant surgery, the peri-implant mucosa heals with little scar formation, and there is an increase in blood vessels and a decrease in peri-implant bone loss resulting in the soft tissue health around the implant. When a full-thickness flap is reflected to reposition keratinized tissue, this additional surgery can cause scar formation in the adjacent soft tissue, infection, and bone loss around the implant (Fig 7-5). Considering all

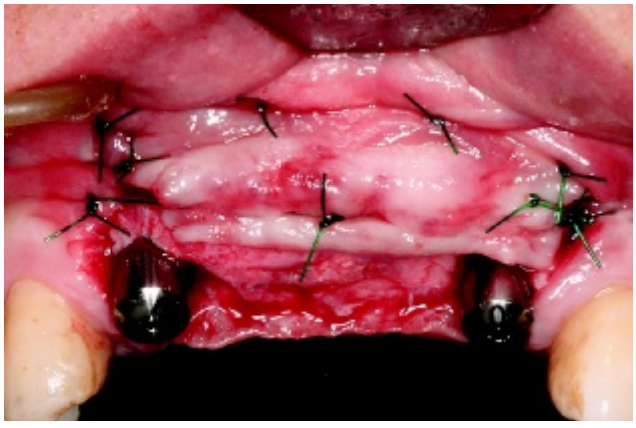
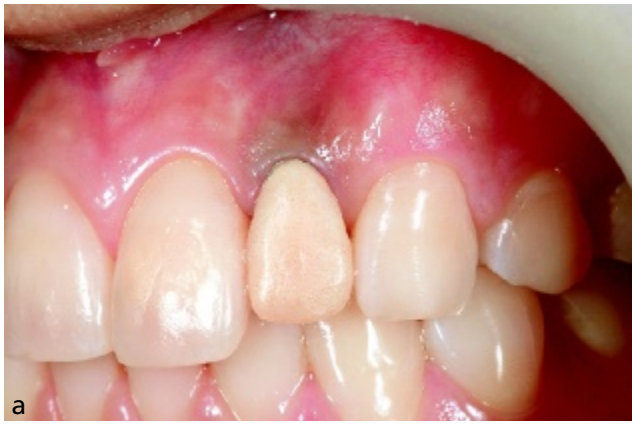
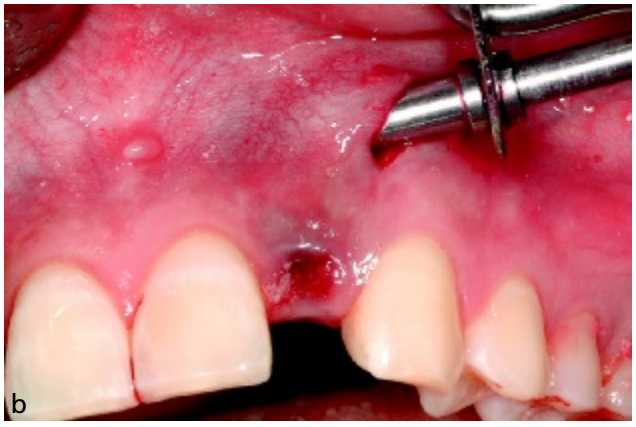


Fig 7-5 When a full-thickness flap is reflected to reposition keratinized tissue, the additional surgery can cause complications such as scar formation in the adjacent soft tissue, infection, and bone loss.





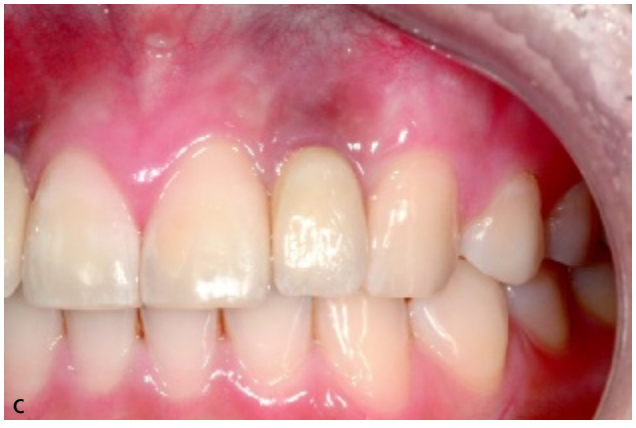


Fig 7-4 The bone defect in the facial region of the upper left lateral incisor implant (a) is reconstructed by a subperiosteal tunneling procedure (b) instead of reflecting a full-thickness flap. Bio-Oss® particles mixed with autologous fibrin gel are grafted. (c) Intraoral view 3 months after surgery. Note that the increased tissue thickness from augmentation prevents the grayish hue of the titanium implant body from being observed through the labial mucosa.

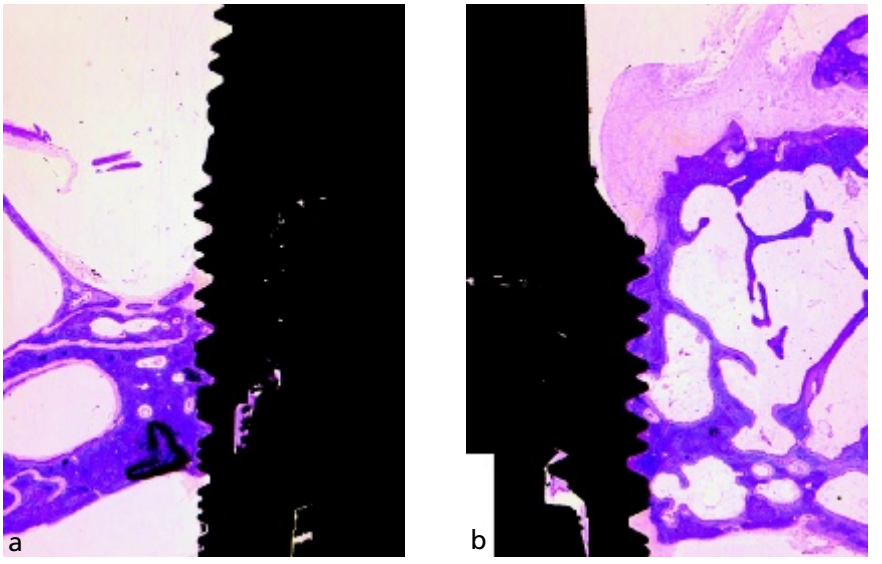


Fig 14-21 (a and b) The average osseointegration rate was only 27.0% at 6 months when 10 mm long implants were inserted in the maxillary sinus using sinus membrane elevation and simultaneous flapless implant surgery with 5 mm of vertical bone remaining between the residual crest of the bone and the floor of the maxillary sinus.

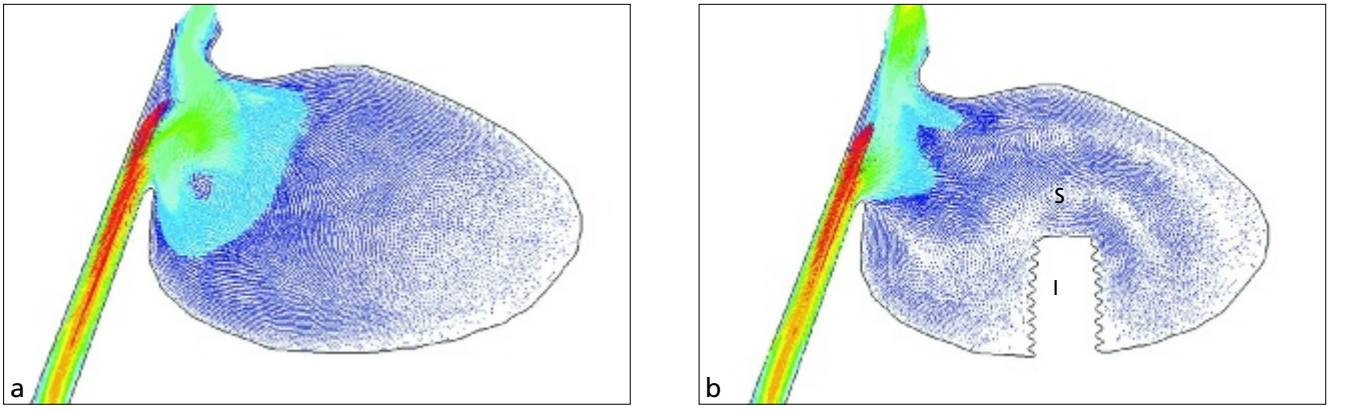


Fig 14-22 (a and b) Implant extension (I) into the maxillary sinus cavity (S) may alter sinus airflow.

extension into the maxillary sinus cavity might disturb the mucociliary function of the antral mucosa, alter the sinus airflow, and be a source of chronic inflammation and sinusitis (Fig 14-22).[23–25] Therefore, the experiment was performed to determine whether implant extension into the maxillary sinus cavity is a source of chronic inflammation and sinusitis.

In six dogs, an implant was placed unilaterally in the maxillary sinus in such a manner that it protruded 5 mm into the maxillary sinus after sinus membrane elevation. On the opposite side, the maxillary sinus was left untreated as a control. The animals were sacrificed 6 months after surgery. The mucosal samples were harvested at the laterocaudal antral wall and examined by optical microscopy as well as scanning and transmission electronic microscopy (Fig 14-23).

Gross examination of the sinuses containing the 5 mm protruding implants showed that the sinus membrane was intact with no signs of infection in any maxillary sinus cavity (Fig 14-24). In addition, all implants were integrated within the surrounding bone. This suggests that the insertion of dental implants into the maxillary sinus cavity does not cause maxillary sinus inflammation or hinder osseointegration of the implants. On microscopic examination of the sinuses containing a 5 mm protruding implant, the sinus membrane appeared to be morphologically intact (Fig 14-25). It did not show any change in the number of glands and goblet cells inside the mucosa. Both transmission and scanning electron microscopy showed that the sinus membrane exhibited a normal epithelial lining with ciliated cells, goblet cells, and basal cells (Figs 14-26 and 14-27).

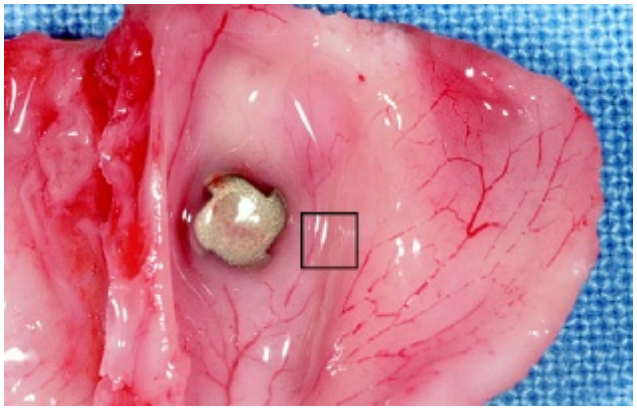


Fig 14-23 Mucosal samples were harvested at the laterocaudal antral wall of the maxillary sinus and examined by optical microscopy and scanning and transmission electronic microscopy.

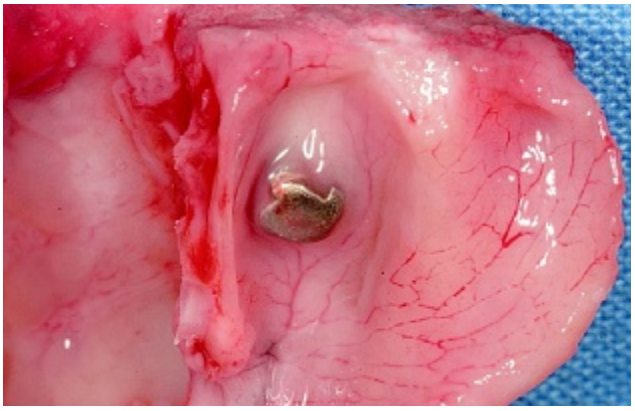


Fig 14-24 Photograph of the maxillary sinus showing the sinus mucosa covering the protruding 5 mm implant 6 months after surgery.

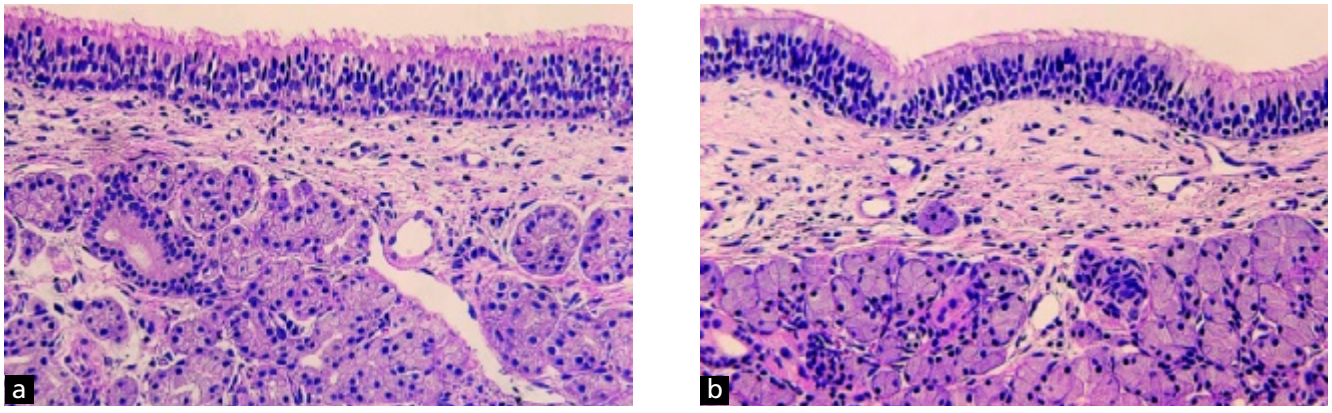


Fig 14-25 Optical micrographs of the maxillary sinus mucosa: (a) untreated sinus, and (b) sinus with the 5 mm protruding implant. The sinus membrane appears to be morphologically intact on both sides. There was no difference in the thickness of either the epithelium or the connective tissue between the untreated and 5 mm protruding implant sides.

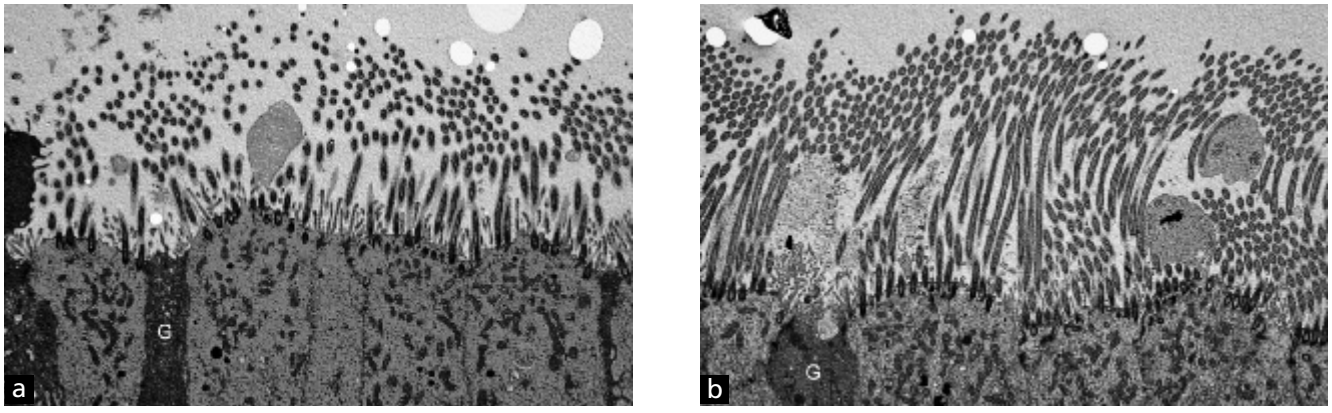


Fig 14-26 Transmission electron micrographs of the maxillary sinus mucosa: (a) untreated sinus, and (b) sinus with the 5 mm protruding implant. Both sinuses show a normal epithelial lining with ciliated cells, goblet cells (G), and basal cells. There is no difference in the number of goblet cells between the untreated and 5 mm protruding implant sides.