Application of Modified Bony Lid Technique to Remove or Replace Compromised Implants: Case Series

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Purpose: *The original bony lid technique involves removing window of cortical bone using a microsaw, removing a failing implant through the window, and then replacing the bone into its original position. The purpose of this case series was to present modifications to the bony lid technique to improve outcomes.*

Materials and Methods: *Ten patients (9 men and 1 woman) aged between 47 and 89 years were treated during a 5-year period with modifications to the bony lid technique. Modifications to the bony lid technique included restricting the size of the bony lid, use of a long shank drill, performing guided bone regeneration, immediate implant placement, and providing rigid fixation.*

Results: *No complications occurred in the 10 cases presented in this case series. An immediate implant placement procedure was performed in 3 of the 10 patients treated. Fixation screws and a microplate were used to fix the bony lid in 1 patient. Allogenic bone was used in another case. Additional trephine and thin drills were used in 2 cases in the mandibular molar area.*

Conclusions: *Replacing failing dental implants can be successfully accomplished by removing cortical bone on the buccal aspect of the implant and then replacing this bone after the implant is removed or replaced. Using allogenic bone, fixation screws, microplates, and thin drills can help facilitate the success of this procedure. (Implant Dent 2013;22:206–211)*

Key Words: bony lid technique, dental implant complications, implant fracture, guided bone regeneration, implant removal

The fracture of a dental implant during placement, and after function, is not a frequent phenomenon.[1–3] However, this type of complication can cause significant problems due to the difficulty in removing the fractured implant and the resultant ridge defects, in addition to needing to modify the prosthetic appliance.[4] In addition, there may be nearby anatomical structures such as roots, nerves, floor of the nasal cavity, other implants, and the maxillary sinus that may increase the risk for removal.[5] In cases where the original implant is placed into bone of minimal quality or quantity, it is critical to maintain as much bone as possible during the removal of fractured implants to allow for placement of another implant. Bone defects as a result of implant removal may require bone augmentation, which adds time, expense, and complexity to the procedure. Thus, it is important to remove the implant with as minimally invasive a procedure as possible.

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Traditionally, fractured implants have been removed using a trephine drill.[6,7] In areas where adjacent roots, the nasal or sinus floor, or nerves are in close proximity, the trephine drill is often limited in its use and it may be difficult to obtain the ideal size or angle due to the need to avoid damage to nearby anatomical structures. Special removal tools are also available, but these are designed for particular implant systems and are thus not ideal if an older implant needs removal. Furthermore, if the implant is partially osseointegrated, removal of that implant is often not possible using these systems.

The bony lid technique has been reported for use in apical root resection of mandibular molars,[8,9] extractions,[10] excision of tumors,[10] and for the removal of the implants.[11] The original bony lid technique involves the removal of cortical bone using a microsaw, with the fractured implant removed through the window and then

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Table 1. Description of Cases Using Modifications of the Bony lid Technique

Patient Demographics (Age/ Gender/Race)	Implant Location (s)	Description of Failed Implant	Treatment Rendered (in Addition to Implant Removal Using Bony Lid Technique)
47/Female/African American	23	Fracture at shoulder level; close proximity to root	Autograft and allograft with immediate placement
54/Male/African American	30	Fracture at shoulder level; close proximity to mental nerve bundle	Autograft, resorbable collagen membrane, immediate placement, microplate and fixation screws
70/Male/Caucasian	7	Fracture; close proximity to root	Autograft, resorbable collagen membrane, immediate placement
89/Male/Caucasian	11	Nonfunctioning with periimplantitis; close proximity to nasal floor	Allograft, resorbable collagen membrane
47/Male/African American	30	Fracture	Autograft
66/Male/African American	18, 19	Periimplantitis; close proximity to inferior alveolar nerve canal	Autograft
47/Male/Caucasian	30	Fracture; close proximity to root and inferior alveolar nerve canal	Autograft
65/Male/African American	5	Fracture	Autograft
54/Female/Caucasian	19	Fracture	Autograft
76/Male/African American	5	Fracture; close proximity of sinus floor and roots	Allograft, resorbable collagen membrane

replaced into its original position. All cuts are made at convergent angulations to the implant to simplify subsequent luxation and to achieve better adaptation during replacement of the bony lid. According to Khoury et al,[11] the advantages of the bony lid method include the ability to preserve the original bony contours by replacing the labial bone wall, no need for further fixation due to beveling of the mesial and distal margins, and easy accessibility. However, it may be possible to further improve the outcomes using this technique by modifying the technique for each unique situation.

The primary purpose of this case series was to present detailed results from 4 of 10 patients with compromised implants necessitating removal. These cases were treated using modifications to the bony lid technique for the purposes of implant removal, conservation of bone, and augmentation of residual defects. Additional supporting information for the remaining 6 patients is also presented to highlight the success, advantages, and disadvantages of the technique.

Materials and Methods

Ten patients aged between 47 and 89 years (9 men and 1 woman) were included in this case series. These patients all presented to the Veteran's Affairs Hospital in Detroit, Michigan, between 2005 and 2010 with a compromised implant necessitating removal. All patients were in good health and presented no contraindications for surgical treatment. After the treatment was described in detail, all the patients signed an informed consent document.

Panoramic radiographs, periapical radiographs, and cone beam computerized tomography (CBCT) imaging were used to properly evaluate the implant sites before removal using the bony lid technique. Patients were premedicated with either 1 g amoxicillin or 600 mg clindamycin 1 hour before surgery and then continued either 500 mg amoxicillin three times a day or clindamycin 300 mg four times a day 7 days after surgery. The surgical procedures were performed under local anesthesia using 2% lidocaine with 1:100,000 epinephrine.

Clinical Cases

Table 1 shows demographic and treatment data for all 10 patients. Figure 1

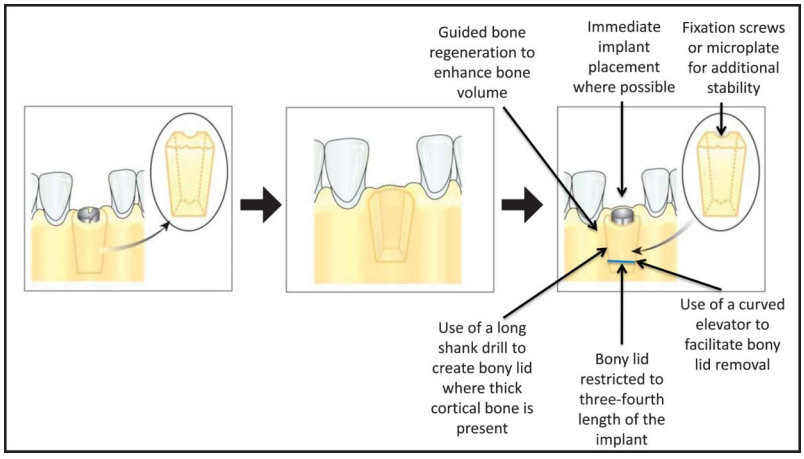

Fig. 1. Schematic illustration of bony lid technique and possible modifications.

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describes the original bony lid technique along with the suggested modifications presented within this article.

Case 1

A 47-year-old African American female patient presented to the Veterans Hospital in Detroit, Michigan, with a chief complaint that tooth #23 was discolored and mobile. The patient reported a history of trauma to the tooth 10 years ago when it was avulsed and reimplanted. The radiographic evaluation and oral examination revealed that tooth #23 had internal and external root resorption at the level apical to the cementoenamel junction rendering the tooth hopeless. Tooth #23 was luxated and extracted atraumatically and then the implant site was prepared and a 3.5 × 13-mm implant was placed. During implant insertion, the head of the implant fractured due to inadequate torque in dense bone (Fig. 2, A). The periapical radiograph shows the proximity of the implant to the adjacent roots.

The bony lid was created within the cortical bone on the labial side of the implant using a Microsaw (Friadent; Denstply, York, Pennsylvania). The bony incisions were performed on the distal, mesial, and apical area of the implant. The mesial cut was reinforced with a bur to allow sufficient access for a chisel to aid in the bony lid removal (Fig. 2, B). In this particular case, the traditional bony lid method was also modified to preserve the lower portion of bone adjacent to the implant to facilitate immediate implant placement after the removal of the broken implant. Then, the fractured implant was removed through the window after additional preparation of the implant bed to get primary stability of the implant by placing the implant deeper. A new implant was then placed in the original site (Fig. 2, C). The outer cortical portion (bony lid) was replaced into its original position and both autogenous, and allogenic bone (Puros; Zimmer Dental, Carlsbad, CA) was added over the bony lid to augment the bony contour along with a resorbable membrane (Fig. 2, D and E). The primary soft tissue closure was achieved using periosteal scoring and 3-0 polyglactin 910 sutures. The wound healed uneventfully without complications.

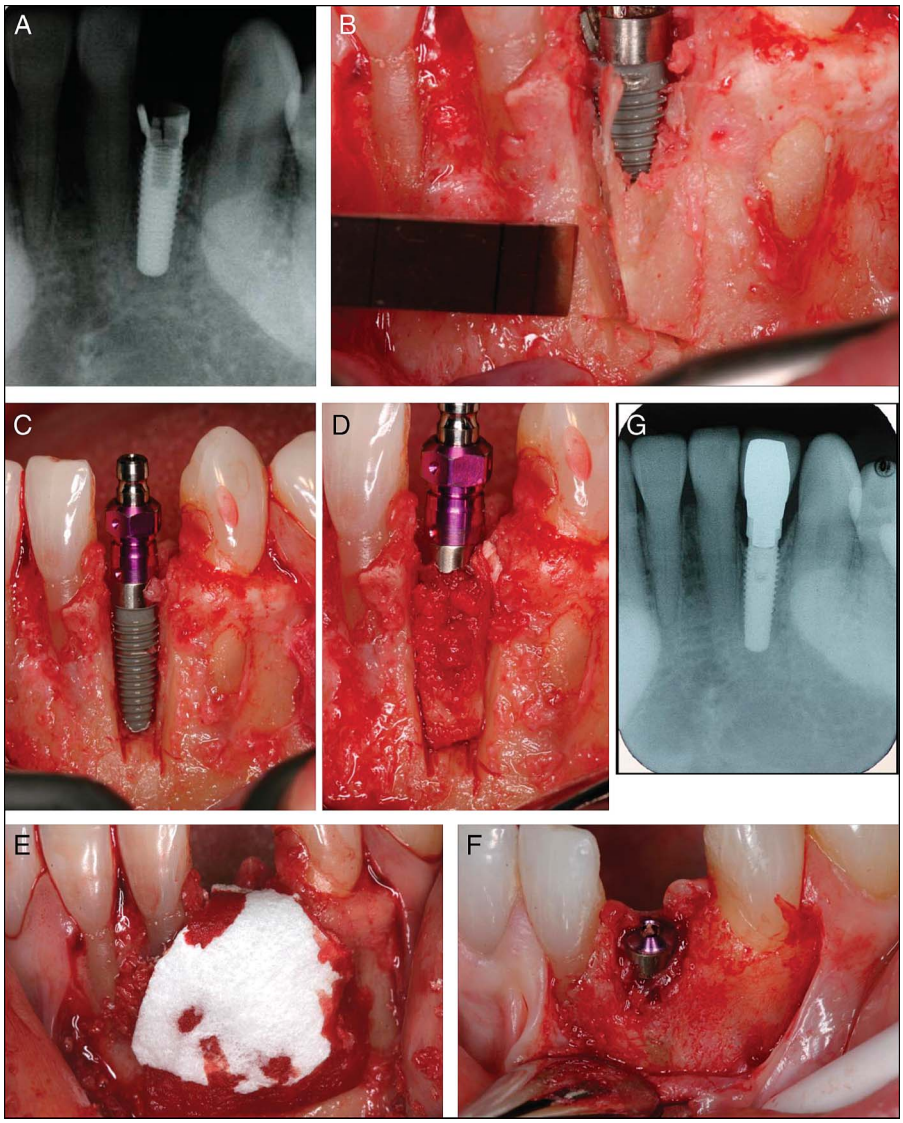

Fig. 2. Radiographs and clinical photographs of implant placed in position #23 in patient 1: **A**, Radiograph of fractured implant #23; Clinical photographs of (**B**), bony lid incision design restricted to coronal three fourths of implant and use of a curved elevator to gently elevate the bony lid; **C**, placement of a new implant; **D**, replacement of the bony lid; **E**, guided tissue regeneration using bone allograft and resorbable collagen membrane; **F**, reentry showing bone levels within normal limits; and **G**, radiograph of replaced implant fully restored at 3 months.

After 3 months healing, the implant was uncovered revealing what appears to be healing of the bony lid to the adjacent bone (Fig. 2, F). Implant stability was confirmed using the Periotest (Medizintechnik Gluden, Modautal, Germany) and a reading of −4 was obtained. A connective tissue graft was then performed on the labial side of the implant to enhance the soft tissue volume. A custom abutment and porcelain fused to metal crown was delivered 3 months later with stable bone levels (Fig. 2, G).

Case 2

A 57-year-old African American male patient presented to the Veterans Affairs Hospital in Detroit, Michigan, with a chief complaint of a lost crown on tooth #30. Intraoral and radiographic examination revealed a dental implant that was fractured along the coronal third of the implant and that a neighboring root and the mental foramen were in close proximity (Fig. 3, A). After informed consent and local anesthesia, full thickness flaps were elevated

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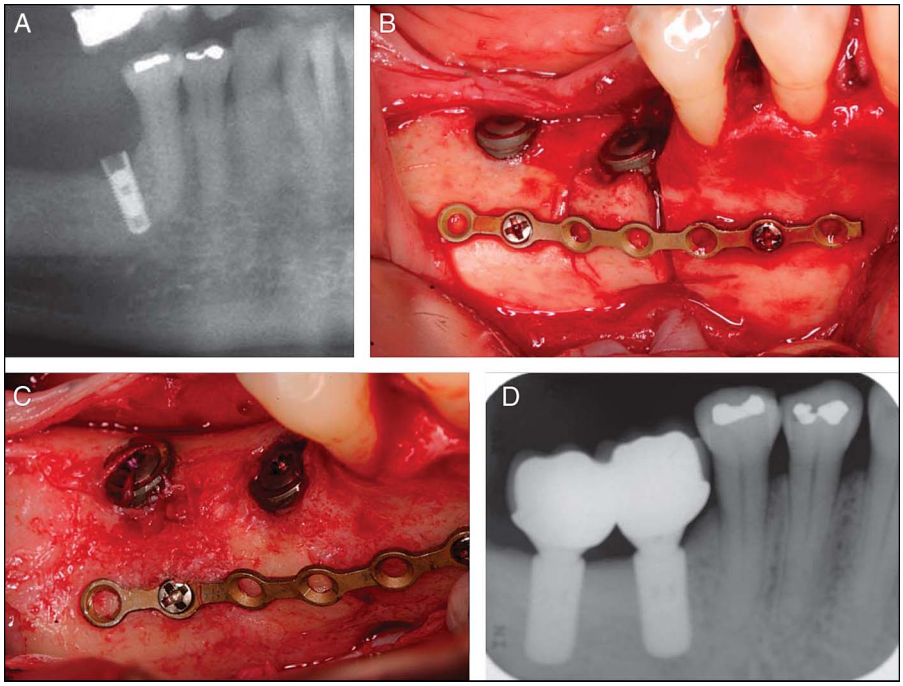

Fig. 3. Radiographs and clinical photographs of explantation of implant #30 and placement of implants in #30 and 31 positions in patient 2. **A**, Pretreatment radiograph showing close proximity of implant #30 to the apex of #29; **B**, bony lid created using a microsaw and fixation of the bony lid using microscrews and a microplate after placement of implants in positions #30 and 31; **C**, reentry showing bone healing; and **D**, final radiograph of the restored implants.

around the implants. The mental foramen was identified and carefully protected during the procedure. A bony lid that included 2 vertical incisions and 1 horizontal incision were cut and elevated to remove the implant without injuring the nerve bundle or damaging the neighboring root, and to minimize bone removal around the implant. The implant was removed through the window on the buccal side of the implant using an elevator.

After implant removal and site preparation, two 4.8 × 10-mm bone-level implants (Straumann, Basel, Switzerland) were placed in the area with primary stability. Then, the bony lid was replaced and secured using a microplate and microscrews (Stryker, Kalamazoo, MI) (Fig. 3, B). Autogenous bone chips were then added over the area, and an absorbable collagen membrane (Biogide; Osteohealth, Shirley, New York) was used to cover the bone graft. The mucoperiosteal flaps were sutured with primary closure. The wound healed uneventfully without complications. The microscrews and microplate were surgically removed after 3 months, revealing apparent integration of the bony lid with adjacent bone (Fig. 3, C). The implant was restored with a custom abutment, and porcelain fused to metal crown. Postoperative radiographs revealed sufficient bone around the implant along with appropriate positioning of the implant (Fig. 3, D).

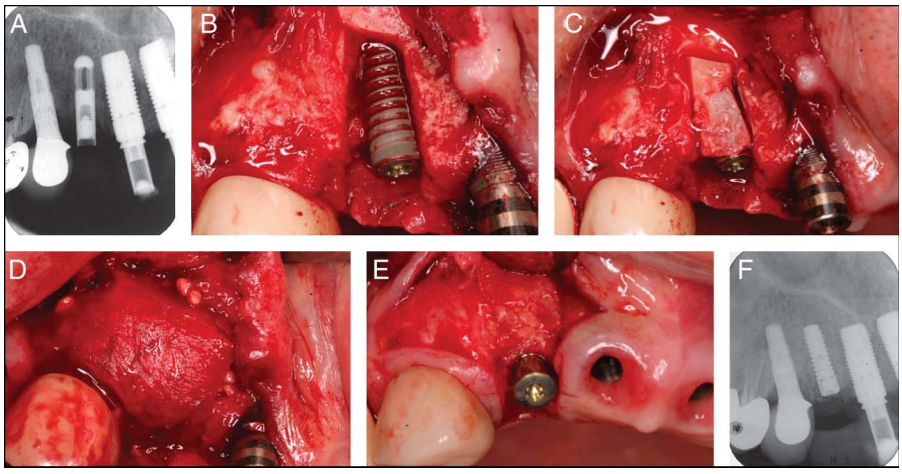

Fig. 4. Radiographs and clinical photographs of implant #7 replacement in patient 3. **A**, pretreatment radiograph of implant #7 with a fractured screw and in close proximity to implant #8; a three-fourth length bony lid used to remove and replace the implant in position #7 (**B** and **C**); **D**, guided tissue regeneration using allograft and resorbable collagen membrane; **E**, reentry showing adequate bone on the buccal of #7; and **F**, post-treatment radiograph of new implant in position #7.

Case 3

A 70-year-old Caucasian male presented with a broken abutment screw on implant restoration #7. The implant had been in function for over 10 years at the time of screw fracture. A periapical radiograph revealed a saucer-like defect around the implant body rendering the implant hopeless due to severe bone loss (Fig. 4, A). The adjacent implants were in close proximity to the fractured implant and so the bony lid technique was used to access and remove implant #7 without compromising the areas around #6 and 8. A bony lid technique was used to remove the hopeless implant with the bony lid restricted to the coronal three-fourth portion of the implant to allow for immediate placement of another implant. After removal of #7 implant, a 3.3 × 12-mm implant (Straumann bone-level implant; SLAcive) was immediately placed and augmented with allogenic bone graft (Puros Cortical Allograft, Tutogen; Zimmer, Tulsa, OK) and a resorbable collagen membrane (RTM collagen; Osteogenics, Lubbock, Texas) (Fig. 4, B–D). Three months later, reentry revealed normal bone levels (Fig. 4, E and F), and then the implant was successfully restored using a custom abutment and porcelain fused to metal crown.

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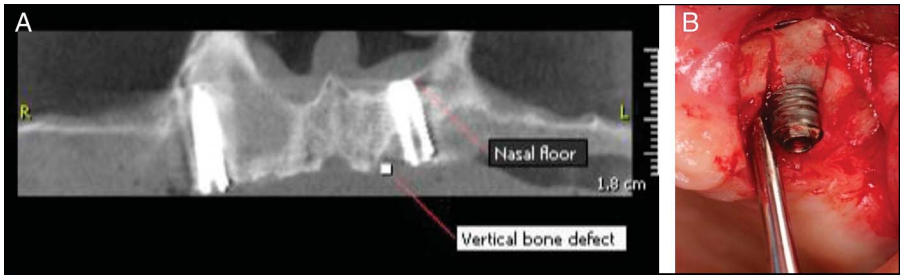

Fig. 5. CBCT and clinical photographs of the removal of implant #11 in patient #4. **A**, CBCT shows implant #11 in close proximity to the nasal floor; implant removal using the bony lid technique and an elevator that was subsequently treated with guided bone regeneration (**B**).

Case 4

An 89-year-old Caucasian male patient presented with a nonfunctioning implant supporting a complete maxillary denture in the area of #11. A CBCT scan revealed that the apex of the implant was in close proximity to the nasal floor (Fig. 5, A). Intraoral examination revealed that the internal threads on the implant were damaged and that there was bone loss on the facial aspect of the implant exposing 5 threads. Probing depths were up to 8 mm around the implant. Thus, the implant was given a hopeless prognosis and scheduled for removal. A crestal incision and 2 vertical releasing incisions were made around implant #11, and a full thickness flap was elevated. Two vertical bony incisions were made using a microsaw and then the implant along with buccal bone cortical bone was removed toward the buccal side (Fig. 5, B). No communication was noted between implant site and either the nasal floor or maxillary sinus. The defect was filled with allogenic bone graft (Puros Cortical Allograft, Tutogen; Zimmer) and covered with an absorbable gelatin sponge. Complete soft tissue closure was obtained, and the wound healed uneventfully.

RESULTS

Ten patients (9 men and 1 woman) aged between 47 and 89 years were treated during a 5-year period with the bony lid technique. In all 10 patients, the implants were removed successfully and the wound healed uneventfully without any major complications such as nerve damage, sinus or nasal floor perforations, or damage to adjacent roots. The bony lids were successfully repositioned into their original location in all 10 cases. An immediate implant placement procedure was performed in 3 of the 10 patients, and all implants were successfully restored and remain in function.

Modifications to the original bony lid technique included the use of additional materials including fixation screws, microplate, allogenic bone, and resorbable membranes. Additional technique modifications included the use of a trephine drill to facilitate removal as well as altering the design of the bony lid to preserve apical bone. None of the patients experienced any complications as a result of the procedures.

Seven of the cases involved the use of autogenous bone harvested from areas adjacent to the defect. Four cases were in the maxilla and 6 cases were in the mandible. All the cases involving fractured implants were single-unit restorations.

DISCUSSION

Occasionally, an implant is deemed to be hopeless and unsalvageable. It would then require removal due to fracture, severe bone loss, mobility, mechanical failures, poor positioning, or encroachment on vital structures.[4] Traditionally, partially osseointegrated implants requiring removal would be removed using a trephine drill, which is the standard technique for removing fractured implants.[4] Then, if indicated, a larger diameter implant would be placed in the same location.[6] However, there are significant limitations to this technique. In some cases, adjacent structures such as nerves, adjacent teeth, or the maxillary sinus may preclude the use of a trephine in the area, or there may be inadequate space to place a larger diameter implant. Furthermore, when vital structures are in close proximity, the trephine cannot be used at the ideal size or angle to avoid damage to these structures. The use of a trephine also removes a significant amount of bone, creating bone defects that require additional surgeries to regenerate bone in the area. In cases where the buccolingual width is narrow, this can create a defect that is difficult, at best, to regenerate. Using a trephine to remove an implant can often prevent the ability to place another implant immediately into the explantation site because the osteotomy site is too large. Wide diameter implants are often placed after removal of an implant using a trephine drill, and this has been successful according to previous reports of immediate implantation.[6,12] However, in situations where the alveolar ridge is thin and narrow, placing a larger diameter implant is not possible without concomitant loss of significant labial or lingual cortical bone. In 2 of the reported cases mentioned above, the bony lid technique preserved buccal and lingual bone, thus facilitating immediate placement that would otherwise have been challenging.

Since the bony lid technique was reported,[9,11] there have been few additional reports published on the technique.[8,10] Furthermore, while successful, this technique may need to be modified for different clinical situations. To improve upon this technique, this case series highlighted its application which was modified in the following ways:

1. The size of the labial bony lid was restricted to three-fourth of the length of the implant to preserve the apical portion of the outer cortical bone adjacent to the implant.
2. A long shank drill was used in addition to a microsaw disc due to the increased thickness of cortical bone in the mandible to allow complete penetration into trabecular bone to facilitate removal of the bony lid.

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3. A curved elevator was used to remove the implant fixture from the lingual side of the alveolar ridge due to the good adaptation of the curved end of the elevator.
4. Guided bone regeneration (GBR) was used concomitantly to enhance bone volume in the area.
5. Immediate implant placement was performed where possible.
6. A microplate and/or fixation screws were used for rigid fixation of the lid where additional stability was required.

In 3 cases, an immediate implant placement was performed along with GBR to preserve the existing bone and provide additional bone augmentation. In 1 case, this allowed for the same diameter implant to be placed, whereas in the other 2 cases, larger diameter implants were used. This is consistent with other studies which reported that implants placed immediately after implant explantation due to biomechanical failure could be performed with results that are similar to implants placed immediately after tooth extraction.[12,13] In this case report, all 3 implants that were placed using an immediate protocol were successful.

According to the original protocol of Khoury et al,[11] additional fixation devices such as microplates or screws are not required due to beveling of the bony lid. However, in cases where thin cortical bone is present, it may not always be possible to stabilize the lid using mechanical retention through beveling alone. Thin labial cortical bone makes it unnecessarily difficult to place an effective bevel of sufficient width. In 1 case in this report, additional usage of microscrews and a microplate successfully stabilized a thin bony lid without requiring the microscrews to be placed through the lid itself.

Thin cortical bone can also be difficult with respect to maintaining adequate bone volume. To address this, GBR using bone graft and a resorbable membrane was performed in several cases according to the PASS principle for the predictable bone regeneration,[14] which includes (1) primary wound closure, (2) angiogenesis, (3) space creation/maintenance, and (4) stability.

CONCLUSIONS

The bony lid technique has many advantages over the traditional methods for implant explantation such as using a trephine to remove the implant. However, several modifications have been shown to improve the outcomes of this technique. These include restricting the size of the bony lid, use of a long shank drill, performing GBR, immediate implant placement, and providing rigid fixation. The modifications to the bony lid technique have the potential to reduce the loss of existing bone and to preserve the explantation socket, thus minimizing the bony defect, reducing treatment time, and improving patient outcomes.

DISCLOSURE

The authors claim to not have any financial interests, either directly or indirectly, in the products or information listed in the article.

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