Peri-implantitis is an increasingly prevalent condition that, if left untreated, can lead to implant failure and loss. Numerous regenerative treatment modalities have been reported in the literature with varying degrees of success. Unfortunately, there is little consensus regarding optimal methods for predictable regeneration of the peri-implant bone lost due to the disease. This case report presents a 68-year-old healthy, nonsmoking man with peri-implantitis affecting the endosseous implant that replaced the maxillary left first molar. After unsuccessful nonsurgical debridement, regenerative surgical therapy was recommended. Guided bone regeneration (GBR) was performed using natural bovine bone mineral covered with a dehydrated human deepithelialized human amnion-chorion membrane (ddACM). Implant surface decontamination was achieved using a titanium brush. Posttreatment clinical assessment suggested that the patient responded well to surgical regenerative therapy. This response was characterized by the reestablishment of healthy peri-implant soft tissues. From a radiographic perspective, complete bone fill of the peri-implant bony defect was seen. These outcomes were maintained over 2 years. This case demonstrates that it is possible to treat peri-implantitis successfully and obtain stable long-term results with a GBR approach utilizing a xenogeneic bone substitute with ddACM.

collagen), which have reported improved clinical and radiographic outcomes more than 3 years after the initial surgery. Unfortunately, there is still little consensus regarding the optimal methods for eliminating inflammation and inducing regeneration of peri-implant bone that was lost due to the disease process.

Over the past decade, several studies have described the use of dehydrated human deepithelialized human amnion-chorion membranes (ddACM) for various surgical procedures in dentistry. ddACM is derived from human placental tissue and the underlying rationale for its use is that placental tissue is considered to be nonimmunogenic and thus it can be transplanted to nonidentical recipients with minimal rejection-related inflammation at the surgical site. In addition to its barrier function, ddACM has also been shown to be a carrier of numerous (> 200) biologic factors, including but not limited to extracellular matrix proteins, cytokines, interleukins, and tissue inhibitors of metalloproteinase, which are known to play an important role in wound healing.

There is currently a paucity of evidence with respect to the use of ddACM as part of a regenerative strategy for the surgical treatment of peri-implantitis. Described below is a clinical case of peri-implantitis treated with a novel approach involving the use of guided bone regeneration (GBR) with natural bovine bone mineral (NBBM) and aided further by the use of ddACM as a barrier membrane. This particular case was followed clinically and radiographically for a period of 2 years, demonstrating successful resolution of the associated peri-implant bony defect and maintenance of healthy peri-implant mucosal tissues.

Materials and Methods

Clinical Presentation

A 68-year-old healthy, nonsmoking man was referred to the first author (V.M.B.) for consultation regarding bone loss and infection affecting an endosseous implant replacing the maxillary left first molar (site 26, FDI tooth-numbering system). The implant was originally placed by an oral surgeon and subsequently restored by the patient’s general dentist; it had been in function for 7 years without any complications. The patient had no pain or discomfort at the time of consultation. However, he was aware of swelling in the peri-implant gingival tissues and pus discharge from the peri-implant crevicular tissues. Upon examination, the patient’s peri-implant gingival tissues appeared erythematous and edematous. The implant was not mobile, and probing depths along the buccal aspect of the implant ranged from 10 to 12 mm with bleeding on probing (BoP). In addition, pus could be expressed from the peri-implant gingival crevice upon palpation of the buccal tissues. On periapical radiographs, severe angular bone loss was seen at both the mesial and distal aspects of the implant (Fig 1). These findings are consistent with a diagnosis of peri-implantitis and a Class 1b osseous defect.

Treatment

Initial therapy included nonsurgical debridement with local anesthesia using titanium implant curettes (Hu-Friedy) along with adjunctive systemic antibiotics (500 mg metronidazole three times daily for 1 week). This only led to minimal improvements in tissue tone, as
seen at the clinical reevaluation 8 weeks later. Unfortunately, the peri-implant gingival tissues were still erythematous, and an exudate still could be expressed from the peri-implant crevice. Probing depths remained unchanged, and there was no reduction in BoP. The patient was given the options of continued nonsurgical maintenance, implant removal with GBR for future implant placement, or implant retention with GBR. The patient elected to retain the implant with GBR. Informed consent was obtained to proceed with the regenerative surgical therapy.

After administration of local anesthetic, a sulcular incision was made and extended within the gingival sulci to the mesiobuccal line angle of tooth 25 and to the distobuccal line angle of tooth 27, where oblique vertical incisions were made, extending just beyond the mucogingival junction. A full-thickness mucoperiosteal flap was elevated to visualize the osseous defect affecting the implant (Fig 2a). As expected from the clinical examination and preoperative radiograph, there was substantial bone loss along the buccal aspect of the implant (mesial to distal) with nine threads exposed, associated with a well-defined intrasosseous three-walled defect situated more deeply in the lesion (Fig 2b). The palatal bone was intact and the implant was within the bony envelope, which is a favorable situation for GBR. The osseous defect was debrided thoroughly of all

Fig 2  Surgical treatment of peri-implantitis with guided bone regeneration using ddACM. (a) Flap elevation revealed significant peri-implant bone loss on the buccal aspect, with at least nine implant threads exposed. The bony defect was well-contained, and the implant was within the bony envelope. The palatal bone was intact. (b) A titanium brush was used to carefully cleanse and detoxify the exposed implant surface after gentle rinsing with 3% hydrogen peroxide solution. The granulation tissue was thoroughly debrided from the bony defect using periodontal curettes. (c) Clinical view of the implant after debridement of granulation tissue and implant surface decontamination. (d) Minocycline microspheres were added to the reconstituted NBBM particulate graft. (e) The bony defect was carefully grafted with NBBM particulate graft material. (f) ddACM was applied over the grafted area in a dry state. Note that the membrane was not trimmed or adjusted in any manner, as the handling properties of the membrane allow for it to be folded on itself. (g) The membrane was intimately adapted to the site using the rounded edge of a periosteal elevator wetted with saline. The membrane was extended coronally to the restorative margin and at least 2 mm beyond the margins of the newly grafted area. (h) Tension-free primary closure was achieved. Using a moist gauze, pressure was applied to the buccal aspect for 2 minutes to eliminate any dead space.
granulation tissue using a peri-
odontal curette (7/8 Younger-Good, Hu-Friedy). Given that the debride-
ment access and defect morphology
were favorable and the patient’s im-
plant crown was cemented, the deci-
sion was made to leave the crown in
place. Detoxification of the exposed
implant surfaces was performed first
by chemical rinsing of the implant
surface with 3% hydrogen perox-
ide solution, then supplemented by
the use of a titanium brush (i-Brush;
Hubermed) in a slow-speed hand-
piece (900 rpm) under copious irri-

tation 16  (Figs 2b and 2c).

NBBM (OCS-B, Keystone Den-
tal) mixed with 1 carpule (1 mg) of
minocycline microspheres (Arestin,
OraPharma), added for additional
 antimicrobial activity in situ, was
grafted into the osseous defect (Figs
2d and 2e). The grafted area was
then covered with ddACM (BioX-
clude, Snoasis Medical) (Figs 2f and
2g). The membrane was adapted
 intimately to the site and extended
at least 2 mm beyond the margins
of the newly grafted area, effectively
sealing the graft from surrounding
tissues. The rounded edge of a peri-
osteal elevator (P24G, Hu-Friedy)
that was wetted with saline was
used to coax the membrane gently
into an even more definitive adap-
tation. The buccal flap was then re-
placed and secured coronally with
a sling suture using 5-0 monocryl,
and the vertical releasing incisions
were closed with simple, interrupted
5-0 chromic gut sutures (Ethicon,
Johnson & Johnson) (Fig 2h).

Postoperatively, the patient was
prescribed clindamycin (300 mg
three times daily for 1 week; Dalacin
C, Pfizer) and acetaminophen with
codeine (four to six times daily over a
period of 4 days; Tylenol no. 3, Jans-
sen) as needed for pain; he was pre-
scribed this postoperative regimen
of medications due to a penicillin al-

ergy, and he had previously experi-
enced adverse reactions to nonste-
roidal anti-inflammatory drugs in the
past. The patient was also instruct-
ed to rinse with warm salt water four
times daily and to avoid brushing
around the implant and immediately
adjacent teeth for 2 weeks. In the
meantime, the patient was seen at
1 and 2 weeks postoperative for su-
pragingival prophylaxis as he could
not brush or floss during this heal-
ing period. Sutures were removed
after 4 weeks. The patient received
periodontal maintenance care every
3 months. Periapical radiographs
and CBCT scans of the area were
acquired 1 and 2 years after surgery
to assess the bone fill of the peri-
implant defect.

Results

Postoperative healing was unevent-
ful, and the patient was highly
 compliant with oral hygiene and at-
 home care. At 1 year, the site was
healthy from a clinical perspective,
and the patient did not have any
pain or tenderness on palpation of
the buccal tissues. Exudate could no
longer be expressed from the peri-
implant gingival crevice. Complete
bone fill of the defect was identified
radiographically (Fig 3). There was
continued maintenance of healthy
peri-implant soft tissues at 2 years,
with buccal probing depths of 3 mm
at the interproximal aspects and
4 mm at the midbuccal aspect, and
no BoP or suppuration was pres-
ent. Additional radiographic assess-
ment demonstrated that there was
sustained bone fill suggesting that,
over time, there was further consoli-
dation of the bone graft (Fig 4).

Discussion

The efficacy of regenerative sur-

dical therapy in the treatment of peri-implantitis has been evaluated in
different systematic reviews and
meta-analyses.17,18  While regen-

erative procedures employing GBR
using particulate bone in combina-
tion with barrier membranes might
be more effective, the outcomes
of peri-implant regenerative pro-
cedures have also been shown to
have significant variation. This is
exemplified even more in a system-
atic review and meta-analysis17 that
examined the results of these inter-
ventions in 173 implants. The review
reported that 85.5% of implants
showed bone level gain, while
4% failed to gain any new bone or
showed bone loss; only 18 implants
(10.4%) showed a complete fill of the
intrabony defect. Overall, there
is limited consensus in the literature
regarding the predictability and
long-term stability of these proce-
dures.

While reossseointegration of con-
taminated implant surfaces is pos-
sible with the use of regenerative
therapies,19 it largely depends on
the clinician’s ability to decontami-
nate the implant surface. Irrespec-
tive of the therapeutic approach, the
primary objective of peri-implantitis treatment is to remove the biofilm from the implant surface to promote proper healing.\textsuperscript{20} This becomes more challenging with the moderately rough surfaces used in current implants because they tend to accumulate more biofilm, thereby making biofilm removal more difficult even when mechanical and/or chemical methods are used.\textsuperscript{21} Prevention postsurgical biofilm formation, especially in the early stages of healing, is also important in obtaining a favorable outcome.

While there is strong clinical evidence demonstrating that rinsing with 0.12% chlorhexidine gluconate is efficacious against oral biofilms,\textsuperscript{22} the fact that a chlorhexidine rinse was not employed for the present patient is supported by data demonstrating that chlorhexidine molecules might alter the cytocompatibility of titanium surfaces, which could theoretically interfere with osseointegration.\textsuperscript{23} Thus, it was decided to have the patient rinse with warm salt water instead, and supragingival prophylaxis was performed in the area for plaque control once a week for the first 2 postoperative weeks.

The advent of newer debride-ment instruments, such as the titanium brush (used in the present case), almost certainly contributed to the success observed in the present study. In vitro investigations have shown that the use of titanium brushes do not significantly alter the microsurface topography of implant surfaces.\textsuperscript{24} Furthermore, using titanium brushes can lead to improved plaque removal compared to
stainless steel curettes. Another recent study evaluating the adjunctive effect of a titanium brush on implant surface decontamination during regenerative surgical therapy for peri-implantitis demonstrated a significant reduction in peri-implant probing depth at 12 months postoperative. The reduced probing depth observed in the present case is consistent with the results from these earlier investigations. The morphologic features of osseous defects surrounding an implant with peri-implantitis can also profoundly influence the outcome of regenerative therapy. Schwarz et al demonstrated that circumferential peri-implant defects are the most prevalent (~55%) but generally achieve greater probing depth reductions and clinical attachment level (CAL) gains at 6 and 12 months compared to other defect morphologies. Serino et al demonstrated that more than one-third of defects exhibit a semicircumferential bone loss pattern with buccal bone dehiscence, which is similar to the peri-implant defect described in the present case, which was an advanced Class 1b (> 6 mm and/or > 50% of implant length with two or three residual bone walls). These defects have been shown to be the least favorable for CAL gain.

The present case report shows complete defect resolution and substantial reduction of buccal probing depths (7 to 8 mm) of an advanced Class 1b osseous defect employing a GBR approach with NBBM and ddACM. Healthy and stable peri-implant soft tissues and a thick buccal bone shelf (> 2 mm) were created following the intervention, and these improvements were maintained successfully over the 2-year follow-up period. These improvements are typically associated with increased implant survival and a decreased risk of peri-implantitis recurrence. While thorough defect debridement and meticulous implant surface decontamination with the titanium brush, used in combination with the chemical elements described above, were undoubtedly important for the successful results in the present case, it is likely that the choice of barrier membrane was also a critical factor, given the severity of the bony defect. For these reasons, ddACM was selected for its unique physical and biologic properties, thus making it an attractive alternative to the traditionally used collagen-based membranes. To the present authors’ knowledge, there is only one other case report in the literature that used ddACM and demonstrated substantial bone fill of the original peri-implant bony defect; in the report, the authors used freeze-dried bone allograft, and reentry was done at 1 year.

ddACM comes as a thin, dehydrated sheet that, upon hydration with saline or contact with oral fluids, becomes pliable and can be intimately adapted to the grafted site. This mechanical prevention of undesirable soft tissues from growing into the grafted defect while providing adequate space for bone regeneration are key biologic requirements for successful GBR. The ddACM can also be folded onto itself without additional trimming, as is required for conventional resorbable membranes.

ddACM has also been shown to have antimicrobial properties against oral anaerobes. Cha et al recently showed that local delivery of minocycline during surgical treatment of peri-implantitis provides significant clinical benefits and is associated with higher rates of treatment success. The combination of ddACM and NBBM particulate graft with incorporated minocycline microspheres used in the present case was likely beneficial, given that successful results were achieved in spite of keeping the implant crown in place during surgery and the subsequent healing. Typically, prosthesis removal with primary closure and submerged healing is recommended, as it is thought to be more conducive for aseptic healing. However, given that the implant crown was cemented, it would likely need to be sacrificed, and the patient was not agreeable to this.

Lastly, the cost of ddACM is comparable to other commercially available conventional resorbable and nonresorbable barrier membranes. In fact, using ddACM may be more economical, as its favorable biologic properties thereby require less postoperative management, even in the face of complications such as premature membrane exposure.

Conclusions

The present case report describes a novel approach for the surgical
regenerative treatment of peri-implantitis by way of GBR using NBBM and ddACM on a decontaminated implant surface. With this approach, peri-implant soft tissue health can be reestablished and a thick buccal bone shelf can be developed, at least over a 2-year period. Within the limitations of a case treated in a private practice setting, reentry and histologic sampling are typically not performed, so it cannot be conclusively stated that implant reosseointegration or bone regeneration occurred. Furthermore, it is difficult to quantify the influence of any one component of the surgical technique on the healing process and outcome. However, the successful outcome obtained by the present technique (1) exemplifies the notion that ddACM has the potential to be used as a barrier membrane in regenerative therapy for peri-implantitis and (2) agrees with the authors’ experiences with this type of membrane, used in other forms of surgery, in which substantial and positive effects on healing were seen.35 Further research using ddACM for this indication that involves larger case series, controlled clinical trials, and histologic analysis will be required to more reliably validate the predictability of the present technique and to evaluate long-term clinical and radiographic stability of the results.

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References


