Management of a Nontreatable Mandibular Anterior Tooth

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Learning Objectives: After reading this article, the individual will learn: (1) interdisciplinary management of a severe bony defect in the anterior mandible, and (2) specific treatment to re-establish function, aesthetics, and speech after removal of a nontreatable mandibular anterior tooth.

About the Authors

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Periodontal disease is an inflammatory condition affecting the supporting structure of teeth that leads to the formation of pockets, which promotes pathologic changes and, ultimately, bone resorption and tooth loss. Many teeth are lost due to periodontal disease or caries, in addition to trauma or congenital absence. Tooth loss caused by chronic periodontal disease creates challenges for clinicians, because sufficient bone volume may not be present to support an implant. More challenges can be expected if the periodontal disease was severe and caused the involved tooth to become nontreatable; that is, bone loss greater than half of the root length, bleeding on probing, suppuration, deep probing, and even Class III mobility. If this takes place in the anterior mandible, the limited space for reconstruction presents an additional challenge. In the case report presented, the patient had severe periodontal disease in the anterior mandible; therefore, re-establishment of aesthetics, as well as function and speech, was important.

The etiology of periodontal disease is bacterial plaque in a susceptible host. The presented patient had undergone multiple treatments, but the outcome was poor because conventional cleaning had been ineffective owing to the deep pockets. Supragingival plaque management cannot control the subgingival environment and leaves the area susceptible to breakdown of the supporting structures, although locations of further periodontal breakdown are not always predictable. An 8-year follow-up study showed that patients require periodontal maintenance, even if they have excellent oral hygiene.

Although periodontal disease is not life threatening, it needs to be detected and treated in a timely manner to reduce the rate of bone loss for involved and neighboring teeth. Dental implants have an excellent long-term survival rate, especially in the mandible, as a replacement for missing teeth. Alveolar ridge augmentation is a viable means of reconstructing defects caused by periodontal disease prior to implant therapy. Retrospective 5- and 7-year clinical studies of single-tooth mini implant restorations showed that this method was a successful solution for functional and aesthetic challenges where space problems limited the use of standard- or wide-diameter implants. A reduced implant diameter (mini implant) did not compromise their performance; Hirata et al concluded that mini implants are safe as single crowns in the anterior region. Another study showed that narrow implants protect peri-implant crestal bone. Osseointegration and crestal bone loss were the same for narrow and mini implants, and implant diameter did not influence crestal bone loss. Mini implants have also been shown to be a viable means for long-term prosthodontic support. Gleiznys et al concluded that mini...
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Implants can be used successfully in a variety of clinical situations. Their advantages include reduction in surgical time, less postoperative pain, capacity to withstand direct loading after surgery with no harm to bone, and lower cost.

The purpose of this article is to present a case report describing the interdisciplinary management of a severe bony defect that resulted from the removal of a nontreatable mandibular anterior tooth. Treatment to re-establish function, aesthetics, and speech involved placement of a dental implant. The presentation provides documentation of the clinical, photographic, radiographic, and 3-dimensional images of the case.

CASE REPORT

A 65-year-old female was referred to our office for treatment of a periodontal abscess, which had formed in time while other types of nonsurgical treatment were accomplished. Scaling and root planing, laser therapy, Water Pik (Waterpik), systemic antibiotics, and local delivery of medication (Arestin [Valeant Pharmaceuticals]) had not resolved the deep pocket associated with tooth No. 24 (mandibular left central incisor). Clinical and radiographic evaluation of the tooth disclosed a missing facial plate, deep probing, bleeding on probing, purulent exudate, labial positioning, and Class II mobility (Figure 1). Therefore, tooth No. 24 was diagnosed as hopeless and tooth No. 25 (the mandibular right central incisor) as guarded.

The patient had severe periodontal disease in the anterior mandible; therefore, re-establishment of aesthetics, as well as function and speech, was important.
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Dosepak [methylprednisolone oral], and chlorhexidine rinse (Acclean 0.12% oral rinse USP [Henry Schein], twice daily). Vertical incisions were made from the distal aspect of tooth No. 23 and extended to the mesial aspect of tooth No. 26 to provide access to the bone and tooth root at No. 24. A No. 15 blade (Carbon Steel [Benco Dental]) was used for the intrasulcular incision and the 2 vertical incisions. Elevation of the flap extended beyond the mucogingival junction to enable proper debridement of the bony defect and to facilitate ridge augmentation, which requires coronal advancement of a flap (Figure 2). Reflection of the flap disclosed absence of the buccal plate at No. 24, a paper-thin buccal plate at No. 25, and moderate bone loss at No. 23. Heavy subgingival calculus was observed on the facial aspect of No. 24 approaching the apex of the tooth (Figure 2).

Tooth No. 24 was removed (Figure 3), disclosing a large (4 x 10-mm) bony defect. This was debrided to the extent that only bare bone could be seen. The defect was reconstructed with freeze-dried bone allograft and a titanium-reinforced Cytoplast Barrier Membrane (Osteogenics Biomedical). The site was secured with polytetrafluoroethylene sutures, and an Essex retainer was delivered for provisional replacement of the missing No. 24.

Figure 4. The defect was reconstructed with freeze-dried bone allograft and a titanium-reinforced Cytoplast Barrier Membrane (Osteogenics Biomedical). The site was secured with polytetrafluoroethylene sutures, and an Essex retainer was delivered for provisional replacement of the missing No. 24.

Figure 5. (a) Facial, (b) occlusal, and (c) surgical views 5 months after ridge augmentation. Significant faciolingual bone gain (4 to 5 mm) can be observed in the occlusal view.

Figure 6. Composite cross-sectional and anterior views of the grafted site (5 months post-augmentation). Significant gains are apparent. More height was gained on the facial than the lingual aspect. Replacement of No. 24 with a narrow-diameter (1.8-mm) implant of about 14 mm in length was planned. The red arrows indicate the clear demarcation between native cortical bone (high density) and grafted bone (low density). The white arrows show the gain in the vertical dimension from the red arrows.
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be seen, and no bleeding was apparent following
degranulation of all necrotic soft tissue. The area
was reconstructed with freeze-dried bone allograft
(Maxxeus Dental Cortical Bone, Ref DN025), and
a nonresorbable titanium-reinforced Cytoplast
Barrier Membrane (Osteogenics Biomedical) was
fitted over the graft from the lingual aspect of the
interproximal area extending to 3 mm beyond the
facial apex of No. 24 (Figure 4). The facial flap was
advanced coronally to cover the membrane and
secured into position with single interrupted 4.0
monofilament sutures (Cytoplast polytetrafluoro-
ethylene [Osteogenics Biomedical]). This treat-
ment helped stabilize and save the adjacent teeth,
in addition to rebuilding the lost jawbone. An
Essex retainer was used for provisional resto-
ration (Figure 4).

Three months later, the nonresorbable mem-
brane was removed because of premature expo-
sure, and the area was allowed to heal to ensure
complete soft-tissue remodeling and closure.
Five months post-extraction, the bone available
for implant insertion was evaluated clinically
and radiographically (Figures 5 and 6). Conven-
tional radiographs did not provide a comprehen-
sive picture of the existing hard- and soft-tissue
volume 5 months after ridge augmentation;
thus, computed tomography was performed,
which disclosed significant gains in both the
horizontal and vertical dimensions (Figure 6). The gain in height
was greater on the facial than on the lingual aspect. Clear demar-
cation of native cortical bone (high density) and grafted bone
(low density) was apparent (Figure 6). The gain was 4 mm in the
horizontal direction and 8 mm in the vertical dimension. The
density of the bone at the time of implant placement was Type
III.18 Based on these images, replacement of tooth No. 24 was treat-
ment planned for a narrow-diameter (1.8-mm) implant (Anew
[Dentatus]) of about 14 mm in length (Figure 7).

The definitive crown was delivered one year after extraction
and ridge augmentation (Figure 8). Both the patient and the
treating clinicians are happy with the result.

DISCUSSION
The interdisciplinary approach in this case involved delicate
management of bone and soft tissue, followed by placement of
an implant in a limited space and delivery of a crown, which
was constructed by the restorative doctor. The significant ver-
tical and horizontal augmentation achieved with allograft
enabled insertion of a 14-mm-long implant where minimal
bone had been present at the time of extraction.

Periodontal patients are at a higher risk of failure or compli-
cations related to implant treatment, and periodontitis affects at
least 50% of adults.7 Therefore, it is important to take special care
with the management of implants in these patients.19,20 The type
of bacteria found in the sulci of implants is influenced by the
bacteria that are present on the surfaces of the remaining teeth.
Periodontally compromised patients harbor more motile rods
and spirochetes than healthy or edentulous individuals.21,22
Tizzoni et al23 strongly recommended that the disease process
be brought under control before implant insertion in patients
with severe chronic periodontitis. They also stressed, like Ram-
fjord et al,10 that a regular maintenance program is essential to
the health of periodontal and peri-implant tissues. According
to Nowzari et al,24 the facial alveolar bone in the area of the
maxillary central incisors is very thin (less than 2 mm) in 97%
of normal healthy patients. However, in periodontal patients,
the buccal plate is even thinner or may be absent, and buccal
wall defects must be managed properly before placement of an implant, as was done in the current patient.

Although it is becoming common to place implants into fresh extraction sockets to reduce treatment time and preserve anatomical structures, in this patient we did not carry this out because of the large post-extraction defect. The defect had to be augmented in both height and width to accommodate an implant and to improve the prognoses of the adjacent teeth. Machtet al observed that retained hopeless teeth with untreated periodontal disease displayed 10 times more bone loss on adjacent teeth than when the hopeless tooth was removed. Studies show that following extraction of anterior teeth, in the first 2 years alone, an average of 40% to 60% of the bony ridge may be lost because of resorption.

Our patient had localized severe chronic periodontal disease, which resulted in a Seibert Class III ridge deficiency, because the tissue loss was both horizontal and vertical. Gita and Chandrasekaran used a chin graft to repair a similar defect, but this approach involves additional operative time and morbidity at the donor site, in contrast to our use of allograft. Another group treated a Siebert Class III defect with collagen-based material; they sutured this to the existing labial flap, advanced the whole flap, and replaced the missing tooth with a traditional fixed prosthesis. However, this was not an ideal solution aesthetically. Our patient sought to regain masticatory function, speech, and aesthetics with a personalized and predictable treatment plan.

Pasquinielli recommended that proper diagnosis and multidisciplinary treatment are essential if a predictable result is expected. Faella stated that consultations with professionals in other disciplines will prevent treatment failure and unhappy patients. The multidisciplinary approach used in our patient is just one example of true commitment by dental professionals to the best outcomes for their patients.

CONCLUSION

One year after implant insertion, radiographs showed that periodontal-prosthodontic therapy enabled successful restoration of function in this patient, who is very happy with the outcome. Site No. 24 showed preservation of the grafted alveolar ridge, with no signs of inflammation. The implant was inserted in almost 4 mm of native bone, which provided adequate primary stability.

This case is a good example of team dentistry where close cooperation among professionals enables delivery of outstanding results. Patients expect personalized, preventive, and predictable care. Just like natural teeth, implants need maintenance; therefore, every patient's recall schedule should be individualized. This includes the length of maintenance appointments. Variable factors include but are not limited to the level and efficacy of home care, systemic disease, compliance with the recommended 3-month recalls, patient cooperation, history of periodontitis or occlusal trauma, and access to instrumentation. In general, patients who will lose their front teeth are concerned about the predictability, alternatives, pain, and costs involved with tooth replacement. Close collaboration among professionals during diagnosis, planning, treatment, and follow-up is essential in order to achieve the desired outcome.

References

22. Aspe E, Elliott RR, Overall CM, et al. Microbiota and crevicular fluid collagenase activity in the osseointegrated dental implant sulcus: a comparison of sites in edentulous and
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POST EXAMINATION QUESTIONS

1. Hirata et al concluded that mini implants are not as safe as single crowns in the anterior region of the mouth.
   a. True.
   b. False.

2. Narrow implants protect peri-implant crestal bone. Implant diameter does not influence crestal bone loss.
   a. The first statement is true, the second is false.
   b. The first statement is false, the second is true.
   c. Both statements are true.
   d. Both statements are false.

3. In appropriate clinical situations, the advantage(s) of mini implants is/are:
   a. Reduction in surgical time.
   b. Less postoperative pain.
   c. Lower cost.
   d. All of the above.

4. In the case report presented, a gain in bone of 4 mm horizontally and 8 mm vertically was achieved how long after ridge augmentation?
   a. 2 months.
   b. 3 months.
   c. 4 months.
   d. 5 months.

5. In the case report presented, density of bone at the time of implant placement was:
   a. Type I.
   b. Type II.
   c. Type III.
   d. Type IV.

6. In the case report presented, conventional radiographs did not provide a comprehensive picture of existing hard/soft-tissue volume 5 months after ridge augmentation. Therefore, computed tomography was performed.
   a. The first statement is true, the second is false.
   b. The first statement is false, the second is true.
   c. Both statements are true.
   d. Both statements are false.

7. Machtei et al observed that retained hopeless teeth with untreated periodontal disease displayed more bone loss on adjacent teeth than when the hopeless tooth was removed.
   a. 3 times.
   b. 6 times.
   c. 10 times.
   d. 15 times.
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8. In the first 2 years following extraction of anterior teeth, an average of _______ of the bony ridge may be lost because of resorption.
   a. 10% to 20%.
   b. 20% to 40%.
   c. 40% to 60%.
   d. 60% to 70%.

9. Nowzari et al found that facial alveolar bone width in the area of the maxillary central incisors was less than 2 mm in what percentage of healthy patients?
   a. 56%.
   b. 75%.
   c. 87%.
   d. 97%.

10. Periodonally compromised patients harbor more motile rods and spirochetes than healthy or edentulous individuals.
    a. True.
    b. False.
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