PEER-REVIEWED

Peri-Implantitis Management in All-on-4 Treatment Concept™ Cases

A procedure for correcting defects around tilted and horizontal implants

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As the popularity of the All-on-4 treatment concept (Nobel Biocare; www.nobelbiocare.com) continues to rise in the treatment of fully and partially edentulous cases and in the early treatment of "terminal dentitions," the focus on long-term follow-up and care of these cases becomes more important. Tilted implants offer a specific challenge because they enter the alveolar structures at a 45° angle and, when seated to the desired level, already create a potential defect as half of the coronal portion of the implant is below the osseous crest or, in some cases, left above the ridge.[1-6] At the time of surgery, the ideal solution to correct for subcrestal platform or supracrestal platform implant placement involves leaving the distal aspect of the implant subcrestal and the medial aspect of the implant at the alveolar crest. Bone-level implant designs are preferred for these types of procedures. With proper placement and correct selection of the angled or straight multi-abutments at the initial surgical procedure, the biologic seal formed by the gingival tissues to the multi-abutments and coronal aspect of the bone-level implant fixtures remains intact throughout the entire healing phase, as well as throughout the construction of the definitive prosthesis.[7-9] However, alterations to the well-defined clinical protocols, improper bone reduction techniques, insufficient debridement of residual tooth sockets (in partially edentulous cases), improper implant depth placement in the alveolar crest, poor closure techniques, and a lack of preservation of a sufficient volume of attached, keratinized tissues can all lead to early-onset bone defects around the coronal aspects, precipitating peri-mucositis or peri-implantitis in these types of cases.[10-19]

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Peri-Mucositis/Peri-Implantitis

In peri-mucositis, the disease process is confined to the soft tissues, with no loss of supporting bone around the dental implant(s).[14-19] Bleeding on probing, suppuration, and probing depths generally less than 4 mm are the main indications when diagnosing peri-mucositis cases.[14-19] In peri-implantitis, the symptoms that are observed are the same as in peri-mucositis cases with the addition of supporting bone loss noted around the implant(s).[14-19] Significant factors leading to the development of peri-implantitis include poor hygiene, improper space under the prosthesis, poor anteroposterior spread, and excessive load distribution. It is commonly understood and accepted that peri-mucositis is a precursor to peri-implantitis, and that the bacterial flora present in these case types (Gram-negative anaerobic bacteria) are similar to those generally seen in advanced periodontitis lesions.[20-22]

When bacteria adhere to titanium surfaces, a biofilm layer forms that can lead to infection and the development of peri-mucositis and/or peri-implantitis.[14-22] Successful management and treatment of both peri-mucositis and peri-implantitis requires the removal of this biofilm layer.[23-27] Peri-mucositis will often be successfully managed by this process, while peri-implantitis usually requires a much more involved process to manage the loss of the supporting bone around the implant.[28-29] This process includes the sterilization, detoxification, and decontamination of all implant surfaces affected by the peri-implantitis destruction.[30-36]

Treatment Options

Peri-mucositis can generally be managed by non-surgical, minimally invasive means and

FIG. 1

(1.) Pretreatment clinical view.

treated with antibiotics as a part of the debridement process. However, peri-implantitis requires a more invasive surgical approach to manage the lesions specific to the destruction of the supporting bone around the affected implant(s).[30-36] There are multiple treatment protocols described in the literature to perform the decontamination and detoxification of the affected implant surface.[30-34,37-40]

The following case report will demonstrate the procedure of correcting peri-implantitis defects around tilted and horizontal implants in patients who have undergone the All-on-4 treatment concept procedure.

Case Report

A 62-year-old, non-smoking female patient presented for treatment of deep probing depths and crestal bone loss around tilted and vertical implants that were placed three years prior. The pretreatment clinical view of the treatment area can be seen in Figure 1, while Figure 2 through Figure 4 demonstrate the deep probing depths (4mm to 10mm), presence of suppuration, lack of mobility, and presence of bleeding on probing. The peri-implant defects can be seen in the digital periapical radiographs of the maxillary right (Figure 5) and maxillary left (Figure 6), respectively. Fortunately, the patient also presented with adequate, thick attached keratinized gingival tissues and otherwise good oral hygiene, both of which lend themselves to a more favorable result for the treatment of peri-implantitis type lesions.

Following the protocol outlined in Table 1, the patient was administered an appropriate local anesthetic by infiltration technique, then received mid-crestal incisions and vertical releasing incisions mesially and distally on the maxillary right and left areas. After full-flap reflection was accomplished both buccally and palatally, the residual granulation tissues were removed to ensure that the peri-implant defects were entirely debrided (Figure 7). After debridement of the peri-implant tissues, continued debridement of the peri-implant defects and of the surface coating of the exposed implants was accomplished using a piezo scaler. This was followed by chemical decontamination using a citric acid solution (pH 1.0).

Decontamination was achieved by initially burnishing the exposed implant surfaces, rinsing with sterile water, placing cotton pellets saturated with the citric acid solution for three minutes (Figure 8), removing the cotton pellets, and rinsing with sterile water once again. Figure 9 exhibits the mechanically debrided and chemically detoxified implant surfaces in the maxillary right quadrant.


FIG. 2


FIG. 3


FIG. 4


FIG. 5


FIG. 6


FIG. 7


FIG. 8


FIG. 9

(2.) Excessive probing depth, maxillary right implant. **(3.)** Excessive probing depth, anterior right implant. **(4.)** Excessive probing depth, anterior left implant. **(5.)** Pretreatment digital radiograph, maxillary right. **(6.)** Pretreatment digital radiograph, maxillary left. **(7.)** Removal of residual granulation tissue. **(8.)** Cotton pellets saturated with citric acid, pH 1.0, around the exposed implant threads. **(9.)** Implant surface appearance after mechanical and chemical detoxification, maxillary right quadrant.


FIG. 10


FIG. 11


FIG. 12


FIG. 13


FIG. 14

(10.) Implant surface appearance after mechanical and chemical detoxification, maxillary left quadrant. **(11.)** Implant surface appearance after additional detoxification with an Er:Cr:YSGG laser. **(12.)** PRP solution applied over the detoxified implant surfaces. **(13.)** PRP/graft complex placed, with PRP bioactive membrane applied. **(14.)** Closure of the graft site. **(15.)** One-year postoperative serial view, maxillary right posterior implant. **(16.)** One-year postoperative serial view, maxillary right anterior implant.

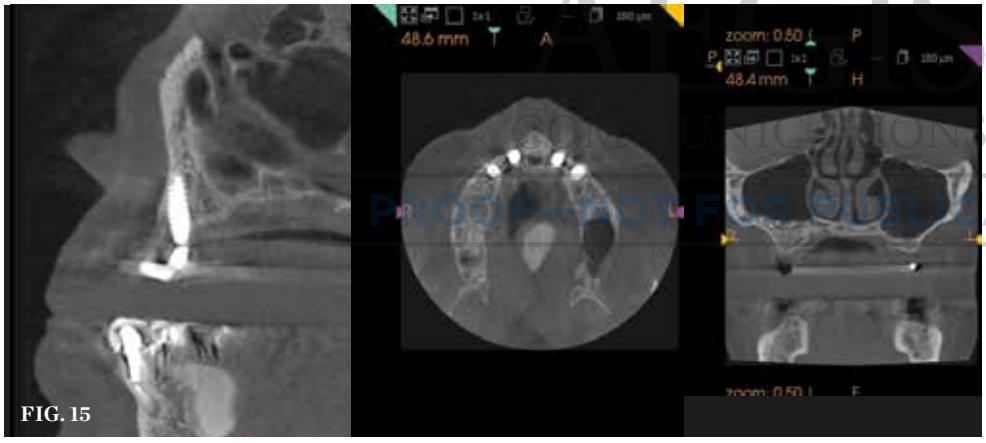

FIG. 15

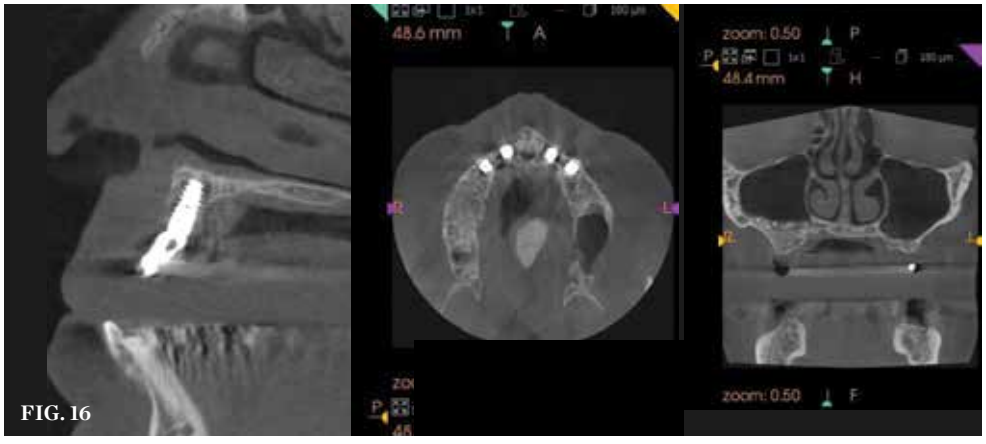

FIG. 16

Note that the area is free of any debris, tartar, and granulation tissue, and that the implant surfaces were restored, exposing the clean titanium. Figure 10 demonstrates the mechanical debridement and chemical detoxification of the upper left quadrant. Further decontamination was accomplished by applying an Er,Cr:YSGG laser at a 6W power setting with 30% air and water lavage to the exposed implant surfaces. This was performed in a circumferential manner with detail given to each exposed thread and visibly confirmed until all exposed aspects of the implant surface were treated. Figure 11 shows the clinical appearance of the implant surfaces in the maxillary right quadrant.

A platelet-rich plasma (PRP) solution, which was obtained by drawing 20 cc of whole blood from the patient prior to the procedure and putting it through a centrifugation process, was then applied (Figure 12). The deactivated platelets and their multitude of growth factors stimulate and attract stem cell growth factors to the surgical site. Next, the allogenic, mineralized, large-particle graft complex was reconstituted with the PRP solution prior to its insertion into the peri-implant defects (Figure 13). An additional level of PRP was then applied over the graft complex to act as a bioactive wound dressing (Figure 13). After closure was accomplished using 5.0 Monocryl® (Ethicon, Inc,; www.ethicon.com) sutures in a continuous sling suturing method (Figure 14), the prosthesis was re-inserted, and the patient was given a prescription for a pain reliever and chlorhexidine mouthrinse to be used for a period of seven days. She was also instructed to complete her antibiotic regimen.

Figure 15 depicts a 1-year, post-treatment computed tomography scan (serial, axial, and sagittal view) of the implant in the premolar region, and Figure 16 depicts a scan of the central region. In the serial view, bone regeneration evident from the successful treatment of the peri-implant defects is observable.

Conclusion

Dental implants have become a consistent option in dental procedures (restorative and surgical) for the treatment of single-tooth, multiple-tooth, and fully edentulous replacement options. Immediate implant loading after placement is becoming more routine, and with the popularity of the All-on-4 treatment procedure, this immediate-loading protocol has proven to be effective for immediate,

TABLE 1

Protocol for Treatment of Peri-Implantitis[35-36]

Antibiotic administration

- Augmentin 875; 20 tablets; 1 tab @ 12 hrs, start the day prior to procedure
- If allergic to penicillin derivatives, Levaquin 500mg; 10 tablets; 1 each day until gone

Preparation of PRP

- 20 cc of whole blood obtained prior to procedure to be centrifuged to provide a platelet-concentrated gel at, minimum, 1 million platelets/µl over entire exposed surface, including exposed threads

Degranulation of peri-implant infected tissue

Piezoelectric scaling (mechanical cleaning) to remove contaminated implant surface

Citric acid (pH=1.0) decontamination (antiseptic chemical treatment)

- Brush-exposed surface of implant threads 3 minutes, rinse

Er:Cr:YSGG laser (decontamination of bacteria and inflammatory debris)

- 6-W power settings, 30% H20, 30% air over the exposed implant thread surface

Application of PRP to defect

Placement of PRP/bone graft complex

- Mineralized cancellous 1-m to 2-mm partial size bone graft

Application of PRP membrane over graft complex

Closure

full-arch transformation of "terminal dentition" patients as well as patients who suffer from complete edentulism. However, variations to the surgical and prosthetic technique, poor patient compliance, and incorrect maintenance procedures can oftentimes lead to peri-implantitis and resultant bone loss in these patients. It is extremely important in these cases to maintain and rescue the original implants, if possible, because following the original treatment planning phase, these patients often have bone volume that is too compromised for revision case management. The technique described in this article has been demonstrated over a 5-year period to provide favorable results in the management of these types of cases as well as for the management of traditional implant procedures.

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