Surgical Treatment of Implants Affected by Periimplantitis After 15 Years of Loading: A Case Report

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Purpose: *The aim of this case report is to describe the surgical treatment of 2 implants affected by periimplantitis after 15 years of loading.*

Materials and Methods: *The treatment included mechanical and chemical decontamination with topical application of tetracycline associated with a regenerative approach. Both defects were filled with particulate autogenous bone from tuber and covered with resorbable collagen membrane.*

Results: *The follow-up of 30 and 13 months of the implants 24 and 14, respectively, showed an absence of clinical signs of periimplant inflammation and near-complete bone regeneration.*

Conclusions: *The therapy approach was effective in eliminating periimplant inflammation and promoting bone gain around the implants. (Implant Dent 2016;25:288–292)*

Key Words: bone regeneration, tetracycline, membrane

The use of dental implants for oral rehabilitation is a widely accepted treatment modality with a high success rate.[1,2] However, despite its predictability, dental implants do show a small rate of failure.[3] These failures could be described as early, when osseointegration fails to occur before occlusal loading, or late, when implants are lost after a period of function.[4,5] Early failures are usually associated with surgical, implant, or host-related factors. Nevertheless, late failures are generally a result of periimplantitis or biomechanical overload.[5,6]

Periimplantitis is an inflammatory process around an implant characterized by soft-tissue inflammation and subsequent loss of supporting bone.[7] This process is a result of an imbalance between bacterial load and host defense that leads to loss of osseointegration and eventual loss of the implant.[4] The prevalence of periimplantitis was estimated by Atieh et al[4] in a systematic review and meta-analysis. It was verified that 18.8% of the participants and 9.6% of the implants were affected by periimplantitis disease. These values demonstrate that periimplantitis is not an uncommon late outcome after implant therapy. Furthermore, they reinforce the importance of a long-term maintenance program to prevent this disease.

Different nonsurgical and surgical approaches have been proposed to control periimplant infection progression and to avoid implant removal.[8,9] The scaling/root planning or mechanical debridement, antiseptic treatment, antibiotic treatment, laser treatment, and regenerative surgery have been suggested to treat periimplant disease.[10,11] The goal of these treatments is to reduce the microbial burden to achieve a state of periimplant mucosal health and to regenerate periimplant bone loss due to the inflammatory process.[10] The effectiveness of these therapeutics approaches has been broadly evaluated.[12,13] However, a definite gold standard treatment could not be identified.

The aim of the present case report is to describe the surgical treatment of 2 implants affected by periimplantitis after 15 years of loading, including mechanical and chemical decontamination associated with a regenerative approach.

CASE REPORT

A 55-year-old male patient in good general health, nonsmoking, whose dental implants had been in function for 15 years, was admitted for routine evaluation within the Dental Implants

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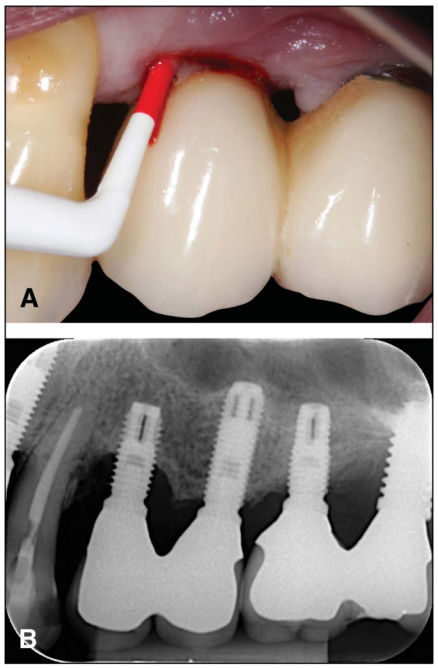

Fig. 1. Periimplantitis affecting the implant at position 24. **A,** Clinical signs of periimplantitis, including increased probing depth, bleeding on probing, and suppuration. **B,** Preoperative periapical x-ray showing a typical periimplantitis crater-like defect.

Fig. 2. Before the surgical access, the fixed bridge over the implants 24 and 25 was removed and local anesthesia was performed.

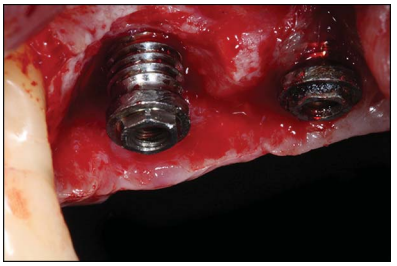

Fig. 3. Intraoperative view of the implants after elevation of a mucoperiosteal flap and debridement of the implant.

Maintenance Program at the School of Dentistry at Araraquara, UNESP. No regular maintenance of the implants was previously performed by the patient who complained of painful symptoms in the gingival tissue around the implants. After clinical and radiographic examinations, 2 implants in the maxilla were diagnosed with periimplantitis. The implants installed in the region corresponding to teeth 24 and 14 revealed the presence of bleeding on probing, probing pocket depths >5 mm, and bone loss. As the first step, a nonsurgical periodontal supportive therapy was performed first to reduce the inflammation. The patient was instructed regarding regular oral hygiene procedures with emphasis to the areas with implants. The first surgical treatment was performed on implant 24 (Fig. 1, A and B). The fixed bridge over the implants 24 and 25 was removed (Fig. 2), and local anesthesia with articaine 4% and epinephrine 1:100.000 was administered. Surgical access to the bone defect was obtained through a mucoperiosteal full-thickness flap. The granulation inflammatory tissue around the implant was removed, and the implant surface was mechanically debrided using plastic curettes (Hu-Friedy, Chicago, IL, EUA) (Fig. 3). The chemical decontamination was performed by topical application of 500-mg tetracycline solution for 5 minutes, followed by an abundant irrigation with physiological saline sterile (Fig. 4). After these procedures, the autogenous graft was harvested from the tuberosity. The bone defect around the implant was filled with the particulate autogenous bone from the tuber and covered with an absorbable collagen membrane (Figs. 5 and 6). A cover screw was inserted and the flap was advanced and sutured using 4-0 silk threads (Ethichon–Johnson & Johnson Medical Limited, New Brunswick, NJ) to obtain a primary tension-free closure (Fig. 7). Postoperative care included a 0.12% chlorhexidine rinse twice daily for 2 weeks, 500 mg of amoxicillin 3 times a day for 7 days, 100 mg of nimesulide 2 times a day for 3 days, and 800 mg of paracetamol as needed for pain. At 2 weeks, the patient was reevaluated and the sutures were removed. The patient

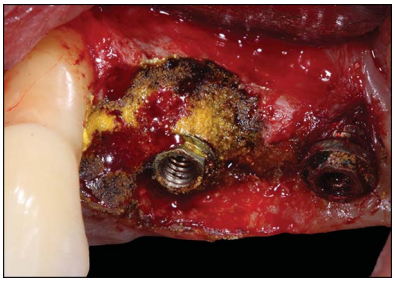

Fig. 4. Chemical decontamination was performed with topical application of 500-mg tetracycline solution for 5 minutes. After this period, an abundant irrigation was performed with physiological saline sterile.

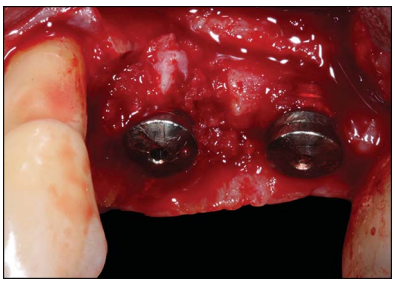

Fig. 5. The bone defect around the implant was filled with particulate autogenous bone obtained from the tuber.

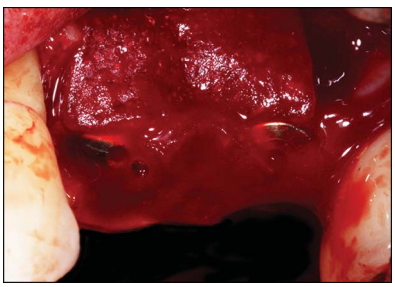

Fig. 6. Intraoperative view immediately after placement of the absorbable collagen membrane. The collagen membrane was used to cover the defect filled with particulate autogenous bone.

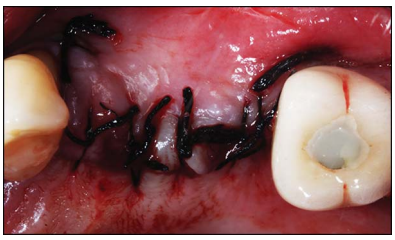

Fig. 7. Front view of the surgical area after suture. The flap was advanced and sutured using 4-0 silk threads to obtain a primary tension-free closure.

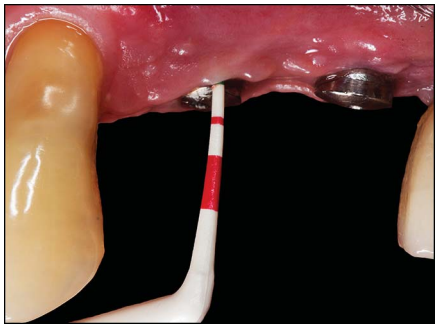

Fig. 8. Clinical situation at the 6-month follow-up showing healthy periimplant soft tissues with no signs of inflammation and suppuration.

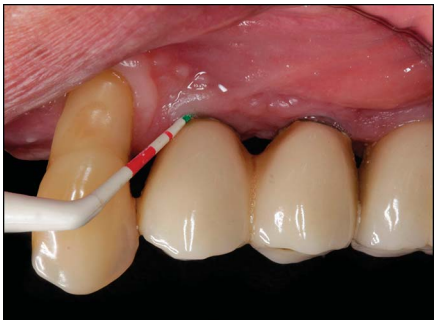

Fig. 10. Clinical situation at the 30-month follow-up showing maintenance of periimplant tissues health. No clinical signs of inflammation could be detected and a physiological probing depth of 2 mm was measured.

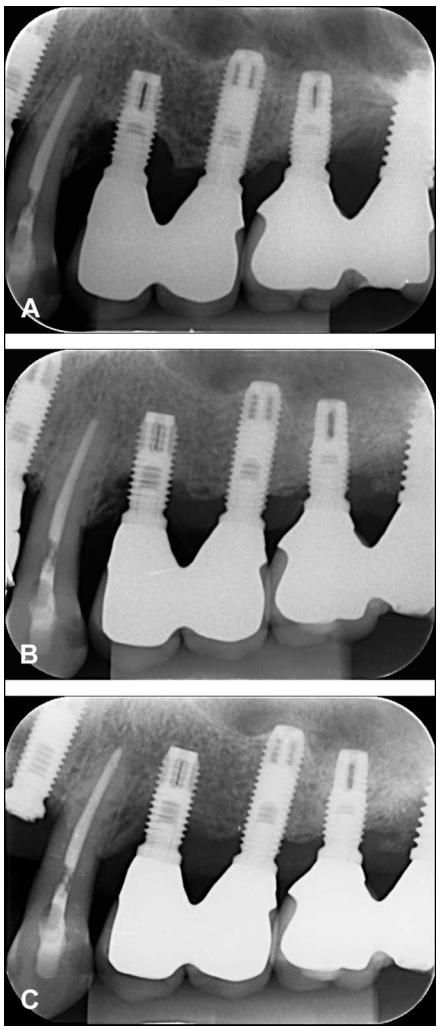

Fig. 9. Comparison among initial (**A**), 6-month (**B**), and 30-month (**C**) periapical radiographs showing significant bone fill around the previously exposed threads of the implant 24 and stabilization of the marginal bone.

was reinforced regarding home oral hygiene techniques. After a 6-month observation period, it was observed an exposition of the cover screw, healing of the infectious process, and reestablishment of periimplanter tissues health. No bleeding on probing could be detected and the probing depth reduced to 3 mm (Fig. 8). At this point, crowns were replaced and an intraoral radiography was taken. An increased radiopacity and a complete filling of the defect with newly formed mineralized bone at the mesial site of the implant and partial filling at the distal site could be observed (Fig. 9, B). The patient underwent regular professional oral hygiene procedures every 6 months, and a recall visit was conducted at least once a year. During the follow-up visit after 30 months, the implant was still supporting a fixed prosthetic crown. The mesial and distal levels of the periimplant marginal bone were radiographically stable and an increased radiopacity was observed (Fig. 9, C). In fact, a significant bone formation could be observed around the implant 24 (Fig. 9, A–C). Moreover, no clinical signs of inflammation could be detected and a physiological probing depth of 2 mm was measured (Fig. 10).

The same protocol described above was applied to surgically treat the implant 14 also diagnosed with periimplantitis (Fig. 11, A). After 13 months of treatment, the clinical examination revealed the presence of healthy periimplant tissues with probing depth of 3 mm and absence of bleeding on probing (Fig. 11, B and C). In relation to the periimplant marginal bone, an increased radiopacity could be observed representing a bone formation in this area.

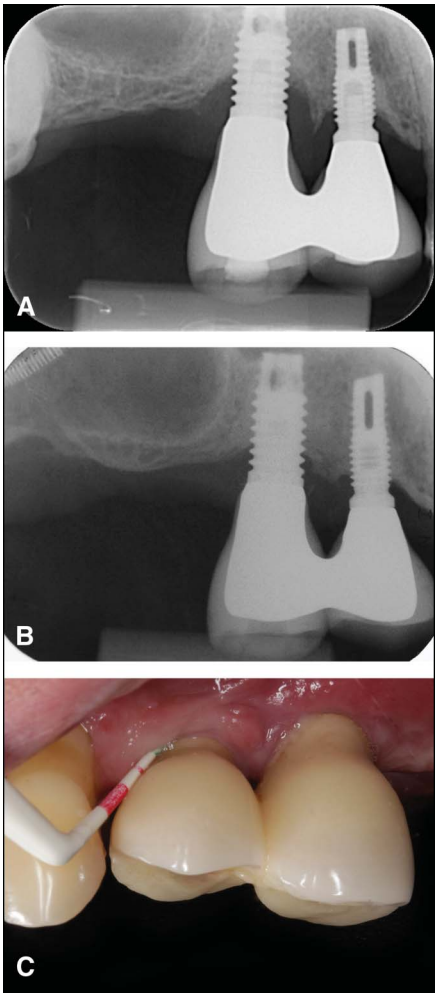

Fig. 11. Periimplantitis affecting the implant at position 14. **A,** Preoperative periapical x-ray showing bone loss around the implant; **B,** periapical x-ray after 13 months of treatment showing bone formation around the proximal sites of the implant; **C,** clinical situation at the 13-month follow-up showing healthy periimplant tissues with no signs of inflammation.

DISCUSSION

The use of dental implants has become a routine procedure to replace missing teeth. A number of clinical studies based on implant survival rate have shown very positive results for these therapies.[14] However, a chronic inflammation of the surrounding soft and hard tissues can be a rather common clinical finding that can manifest and

persist for years.[4] These inflammatory conditions, defined as mucositis and periimplantitis, can be distinguished from each other by the presence of certain clinical findings, particularly the loss of supporting bone around the implant that is found only in periimplantitis.[15] The clinical diagnostic parameters for periimplantitis include the presence of bleeding on probing, increased periimplant probing depth, and radiographic bone loss around the implant.[16] In the present case report, all these clinical signs could be observed in addition to suppuration, confirming the presence of periimplantitis.

Submucosal biofilm in periimplantitis plays an important role in the failure of dental implants.[17] This biofilm exhibits greater bacterial diversity when compared with biofilm associated with healthy periimplant mucosa.[10] The microorganisms most commonly associated with periimplantitis are gram-negative anaerobes related to periodontitis, such as *Prevotella intermedia*, *Porphyromonas gingivalis*, *Aggregatibacter actinomycetemcomitans*, *Bacteroides forsythus*, *Treponema denticola*, *Prevotella nigrescens*, *Peptostreptococcus* micros, and *Fusobacterium nucleatum*.[18,19] For this reason, the removal of bacterial biofilm from the implant surfaces by mechanical debridement has been considered the basic approach to prevent and treat periimplant disease.[20]

Different methods, such as plastic instruments, air abrasives, and polishing rubber cups, have been proposed to remove plaque and calculus from the implant surface, but no gold standard treatment has yet been defined.[20] Moreover, surface alterations caused by instrumentation may facilitate the accumulation of plaque.[21] Therefore, care is necessary to avoid damage to implant surface.[21] Loroupoulou et al[21] verified in a systematic review that rubber cups, both with or without paste, and nonmetal instruments cause almost no damage to smooth implant surfaces. In this case report, plastic curettes were used to remove plaque and granulation tissue associated with the implant surface affected by periimplantitis, which seemed to preserve the surface integrity.

However, mechanical debridement of the implant surface alone cannot result in the complete removal of all adhering microorganisms in the presence of pockets depths ≥5 mm and exposed implant threads.[13] Therefore, the use of local delivery devices, originally developed for periodontitis, has been proposed for periimplantitis treatment.[22] Studies investigating the efficacy of this approach showed that the local use of tetracycline or doxycycline is associated with better clinical results when compared with scaling and root planning alone.[23,24] Monbelli et al investigated the clinical, microbiological, and radiological effects of periimplantitis therapy by local delivery of tetracycline for 1, 3, 6, and 12 months. A significant decrease of the mean periimplant probing depth was observed and the total anaerobic cultivable bacterial counts were significantly lower in comparison with baseline. The distance from the shoulder of the implant to the bottom of the bony defect measured using standardized vertical radiographs decreased slightly, but not significantly. Therefore, the authors concluded that the local delivery of tetracycline had a positive effect on clinical and microbiological parameters.[24] Nonetheless, the application of local tetracycline during the surgical procedure was performed because most of the pathogens present in periimplant infection, such as *P. gingivalis*, and *A. actinomycetemcomitans*, are susceptible to these drugs.[24]

Because nonsurgical therapy has been considered less effective for periimplantitis treatment,[7] surgical therapy including the combination of mechanical debridement and local application of tetracycline was performed in the present case with the goal of decontaminating the implant surface, controlling the infection and, then, eliminating the inflammation progression. Furthermore, a regenerative approach was implemented to treat the well-defined crater-like bone defects around the implants. These kinds of defects improve retention of the bone graft, thereby allowing for an optimal healing.[25] A combination of both membrane and autogenous bone graft was used. Behneke et al[26] obtained positive results up to 3 years after the treatment of periimplantitis defects using autogenous bone grafts. Schwarz et al showed that a combination of natural bone mineral and collagen membrane can provide a clinically significant reduction of the pocket probing depth and a gain in the clinical attachment level. In addition, this combined therapy was associated with a more predictable and enhanced healing outcome.[27] However, another clinical study comparing the surgical treatments of periimplantitis using a bone substitute, with or without resorbable collagen membrane, showed clinical and radiographic stable improvements in both groups after 5 years. Likewise, the additional use of a membrane did not improve the outcome of the treatment in this study.[27] These contradictory results suggest that more data on various regenerative techniques for treating periimplantitis have to be gathered to confirm the efficacy of these therapies.[17]

The healthy periimplant tissue plays an important role as a biological barrier to agents that cause the periimplant disease. Therefore, the preservation of health in this tissue is important to avoid the spread of bacterial contamination directly to the bone, which can lead to its rapid destruction.[17] Based on that, a regular maintenance program must be implemented in rehabilitation treatments with implants.[28] During this maintenance phase, periimplant tissue should be periodically evaluated for inflammation and radiographs should be performed to monitor the status of bone around the implants. Furthermore, patients need to understand the importance of adequate oral hygiene habits and their compliance in the maintenance sessions to avoid periimplant infection and guarantee the long-term success of their dental implants.

CONCLUSION

This case report shows the successful management of 2 periimplantitis lesions. The therapy approach proposed was effective in eliminating the inflammation process and promoting bone gain around the implants. In addition, the positive effects on clinical and radiological parameters were maintained in a long-term as demonstrated by the follow-up controls. Thus, based

on the effectiveness and the safety of the proposed procedures, a randomized clinical trial is suggested to scientifically confirm the benefits of this treatment for periimplantitis management.

DISCLOSURE

We confirm that this article is free of conflict of interest. None of the authors is involved, or has been involved, financially, directly or indirectly, in any of the products mentioned in this article.

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