A New Approach for Treating Peri-Implantitis: Reversibility of Osseointegration

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A New Approach for Treating Peri-Implantitis: Reversibility of Osseointegration

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Learning Objectives: After reading this article, the individual will learn: (1) important clinical information about peri-implantitis and (2) an alternative to the conventional algorithms for treating peri-implantitis.

About the Author

Dr. Anitua earned a degree in medicine and surgery from the University of Salamanca, a PhD in medicine from the University of Valencia, and a specialization in stomatology from the University of the Basque Country. He is director of the Instituto Eduardo Anitua, president of the Eduardo Anitua Foundation for Biomedical Research, and scientific director of Biotechnology Institute (BTI). He is a visiting professor at more than 20 universities worldwide, has published more than 300 papers, is the author of 8 books, and is co-author of 7 books and chapters. He is editor and director of the journal Implant Dialogue and has presented more than 600 courses and conferences on tissue regeneration, implantology, prostheses, and dental aesthetics. He holds 39 international patents developed in the areas of regenerative therapy and oral implantology. He can be reached at eduardoanitua@eduardoanitua.com.

Disclosure: Dr. Anitua is the scientific director of Biotechnology Institute (BTI) and he is the head of the Eduardo Anitua Foundation (Vitoria, Spain).

Today, achieving the integration of implants to restore totally or partially edentulate patients is a reality; there are even established protocols to facilitate, improve, and accelerate the integration process.1–5 The challenge clinicians currently face is very different: What do we do with implants that are affected by peri-implantitis or poor positioning that prevents them from fulfilling their function? This question is becoming very pertinent clinically, and there are numerous points of view on how to tackle this growing problem.

This article presents an alternative to the conventional algorithms for treating peri-implantitis, providing a new approach to this pathology.

MUCOSITIS AND PERI-IMPLANTITIS: CONCEPTS
Peri-implant mucositis can be defined as inflammation confined to the soft tissue surrounding a dental implant caused by the accumulation of bacterial plaque and is not accompanied by bone loss. It is, therefore, an inflammatory process that can be reversed by treatment that is not accompanied by bone loss. It is generally accompanied by bleeding upon probing with controlled pressure (< 0.15 N).6–8 In cases where the gingival inflammation is accompanied by bone loss, the process is defined as peri-implantitis. This can be associated with soft-tissue complications such as fistula, abundant bleeding upon probing, and mobility (depending on the bone loss). The main signs and symptoms of peri-implantitis are as follows:9

- Radiographic evidence of bone loss, although in general an apical area remains intact, covering a larger or smaller area depending on the stage and progression of the disease
- Vertical bone destruction associated with an increase in the probe depth that is generally accompanied by bleeding upon probing and even, in some cases, suppuration
- Gingival inflammation of the surrounding tissues
- Pain (although not in all cases, so it cannot be considered a characteristic symptom).

To be able to categorize the extent of the disease and focus the treatment protocols, Jovanovic10 and Klinge et al11 established a peri-implantitis classification that is principally based on the extent of the bone destruction. This classification helps clinicians understand the severity of the peri-implant bone lesion and, consequently, the process. Generally, a correlation can be found between the different degrees of the classification and the possibility of preserving the stability of the bone tissue and, consequently, of the implant using conventional treatments, which could also be used as a treatment predictor and indicator.

According to this classification clinicians can differentiate the following (Figure 1):

- Class I peri-implantitis: Presence of moderate horizontal bone loss with a minimal intraosseous component
- Class II peri-implantitis: Moderate to advanced horizontal bone loss with a minimal intraosseous component
- Class III peri-implantitis: Minimal to moderate horizontal bone loss with advanced circumferential intraosseous injury
- Class IV peri-implantitis: Implant defects with moderate horizontal bone loss and advanced circumferential intraosseous injury with loss of the vestibular or lingual wall, or both.

The etiology of peri-implant diseases is considered a multifactorial process in which bacteria play a fundamental, but not unique, role. Other factors come into play such as occlusal overload, poor quality of bone, badly designed prosthetic structures, the shape and surface of the implant, the closure of the peri-implant soft tissues, or the existence of parafunctional activity. The rate reported in the literature of this type of pathology is between 35% and 45%.12
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Figure 1. Classification of the extent of peri-implantitis (adapted from Jovanovic\textsuperscript{10}). Classes I and II peri-implantitis may be stable over time by conservative treatment. Classes III and IV peri-implantitis are in general active processes (suppuration) in which, depending on our protocols, the extraction of the implant will be the treatment of choice.

Based on this diagnostic data (probing, suppuration, bone loss, inflammation), the document of consensus and recommendations for clinical procedures to assess the survival of the implants and the complications derived from them as published in 2004,\textsuperscript{13} a treatment algorithm can be drawn for the different degrees of peri-implant disease. In each degree of treatment, we must always add the previous degrees, and the last point is a sum of all the treatments listed in the different combinations. Based on this algorithm, the various treatment protocols are carried out.

This protocol is used by most professionals for treating peri-implant diseases. Despite its widespread diffusion, it has some limitations. In 2011, Heitz-Mayfield et al\textsuperscript{14} concluded that the protocols described for treating peri-implantitis to date present controversies in some points, and there are also doubts in some cases regarding which treatment type to select or whether that treatment would be effective in managing to maintain the implant, reducing the infection and the complications resulting from the treatment itself.

A NEW PROTOCOL FOR TREATING PERI-IMPLANTITIS

Atraumatic Extraction of the Implants

The conventional treatment protocol or algorithm for peri-implant diseases has the following significant deficiencies or limitations:

- In some cases, achieving satisfactory results from an aesthetic and functional point of view for the patient is very difficult.
- On other occasions, subjecting patients to numerous conservative treatments, even surgery, makes multiple surgeries necessary.
- Treatments based on decontamination of the implants are problematic for the following 2 main reasons (Figures 2 to 6):
  1. Fully detoxifying an implant surface exposed to the oral medium and colonized by bacterial plaque is a very complex task despite the fact that the techniques to do so have advanced and posed various therapeutic approaches.

Figure 2. Intense colonization of a dental implant extracted due to peri-implantitis. Cleaning this surface is an impossible task, regardless of the methods used.

Figures 3 and 4. Initial images of a patient with peri-implantitis in one of the implants located in the second quadrant that was treated using the conventional treatment algorithm, with detoxification of the implant surfaces and an attempt at guided bone regeneration that failed.

Figure 5. It was decided to extract the implant and preserve the distal aspect.
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2. In many cases, attempts to clean the surface of the implants causes contamination from the products and techniques involved in the cleaning that worsen the prognosis of re-colonization of the bone in that area due to contamination.

For these reasons, the author believes a new protocol is needed for treating peri-implantitis that can minimize surgery and the complications that arise from this for the patient, as well as offering a quality treatment with a predictability that exceeds the treatments used to date.

On this premise, the author’s team has been researching how to make implants (regardless of the brand) “reversible,” should this be necessary. This is important for treating peri-implantitis because there are many circumstances in which explantation is the only way to achieve a successful treatment. Research has therefore been concentrated on these 2 fundamental pillars:

1. Achieving “de-osseointegration” of the implant in a way that is easy and accessible to any clinician

2. Being as conservative as possible with the bed in which the implant is seated in order to be able to (in some cases) place an implant immediately post-explantation.

The fruit of this investigation is the development of a technique foratraumatic implant explantation, keeping the receiving bed intact and making it possible on many occasions to insert a new implant or regenerate the bed with a better prognosis, as we are faced with a more minor defect.

**IMPLANT EXTRACTION KIT**

**Components and Method**

The kit consists of a wrench that is used to transmit the counter-torque force to the implant through a connector (extractor) that is inserted in the connection of the implant. It is set to 200 Ncm so that when it reaches this torque, it automatically disengages, thus avoiding causing injury due to bone shearing or breakage caused by torques greater than 200 Ncm, or fracture of the extractor inside the implant. When the wrench disengages, it can be reconnected by applying a lever force opposite the elbow to a plastic cylinder that allows it to be inserted and then straightened (Figure 7).

The extractor is positioned using a manual ratchet wrench counterclockwise and then a counterclockwise force...
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(counter-torque) is applied with the wrench to the implant-extractor assembly that generates the breakdown of the bone-implant union, causing de-osseointegration (Figure 8). There are different extractors to adapt to the different implants and their connections (Figure 9).

With this new procedure as described, the implant extraction is fully atraumatic, keeping the peri-implant bed fully intact, so on many occasions a new implant could be placed in the same position (when there is no contraindication due to infection in the bed).

NEW TREATMENT ALGORITHM
The proposed treatment will be different depending on whether it is a case of mucositis or peri-implantitis. With peri-implantitis, the classification by Jovanovic is followed as described above, opting for a conservative treatment (peri-implantitis Classes I and II) or for an interventional treatment with the extraction of the implants (peri-implantitis Classes III and IV).
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Therefore, depending on the clinical picture (mucositis or peri-implantitis) and on the type of defect in the case of peri-implantitis, clinicians can opt for the following treatment algorithm.

**Mucositis:** In cases of mucositis, the first step must be to eliminate the bacterial plaque that may be causing inflammation of the peri-implant tissues. Once the professional hygiene has been carried out, the key point will be to determine whether there is enough keratinized gingiva to ensure the correct behavior of the soft tissue.

For cases in which there is not enough keratinized gingiva, the priority is to replace it using grafts of connective tissue to recover the lost tissue that provides stability to the implant and its restoration.

Once the above factors have been eliminated, it is essential to check the prosthesis. Sometimes insufficient hermeticity in the prosthesis-implant interface may be the cause of bacterial infiltrations that end up triggering peri-implant inflammatory processes. Hermeticity is achieved due to the precise fit of the prosthetic components, and is not the same for all of them. There are different methods for fabricating prostheses on implants, both screw-mounted and cemented, and not all of them provide the same degree of fit and hermeticity.

Therefore, it is advisable to always select the prosthetic option with the best hermeticity when planning restorations. For cemented prostheses, the micromilled posts are a better alternative than cast posts, and for a multiple screw-mounted prosthesis BTI’s MULTI-IM transepithelial abutments provide a better hermetic seal compared to direct-to-implant work (Figure 10).

**Peri-implantitis:** With bone loss of less than 2 to 3 mm without suppuration (Jovanovic Classes I and II), peri-implantitis may be treated by repositioning the soft tissues and checking the seal, thus stabilizing the clinical situation and subsequently the bone loss.

For cases in which the implant has a greater circumferential bone loss or loss of the bone wall (Jovanovic Classes III and IV), the indication shall be implant extraction. For cases in which the implant has variable bone loss and is poorly positioned, and its prosthetic restoration is impossible, the indication shall also be extraction. In both types of cases, our team considers explantation to be the best option, as a poorly positioned implant cannot be correctly restored, and an implant with a high level of bone loss that exposes the implant surface to the oral medium cannot be properly cleaned to avoid bacterial colonization and the volume of bone lost cannot be regenerated predictably. It is very difficult to achieve vertical regeneration of bone bonded to dental implants, so in these cases where there is also a severe infectious component, achieving this bone increase is practically impossible.\(^5\)\(^6\)

**CASE REPORT**

Figures 11 to 19 demonstrate a clinical case in which a patient was treated according to this technology. This case shows how reversibility of the implant treatment has enabled a straightforward solution to a significant problem.

**CONCLUSION**

The treatment algorithm presented enables a reasoned and logical selection of the best treatment option for every peri-implant pathology that clinicians encounter. The treatment options proposed are based on minimizing the repercussions of morbidity for the patient, avoiding costly regeneration surgery that on most occasions does not achieve the effect sought, and providing the patient and the professional with a new vision in the treatment of this type of pathology.\(^\uparrow\)

**References**

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POST EXAMINATION QUESTIONS

1. The main sign(s) and symptom(s) of peri-implantitis is/are:
   b. Vertical bone destruction.
   c. Gingival inflammation of surrounding tissue.
   d. All of the above.

2. Peri-implant mucositis can be defined as inflammation caused by the accumulation of dental plaque that is confined to the soft tissue surrounding a dental implant. It is not accompanied by 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 the peri-implantitis classification of Jovanovic, “minimal to moderate horizontal bone loss with advanced circumferential intraosseous injury” is the definition of:
   a. Class I peri-implantitis.
   b. Class II peri-implantitis.
   c. Class III peri-implantitis.
   d. Class IV peri-implantitis.

4. The etiology of peri-implant diseases can include:
   a. Occlusal overload.
   b. Poor quality of bone.
   c. Shape and surface of the implant.
   d. All of the above.

5. In many cases, attempts to clean implant surfaces causes contamination from the products and techniques involved.
   a. True.
   b. False.

6. In the new treatment algorithm for peri-implantitis presented in this article, the wrench in the implant extraction kit is set to ______ to avoid injury.
   a. 100 Ncm.
   b. 150 Ncm.
   c. 200 Ncm.
   d. 250 Ncm.

7. In the new treatment algorithm for peri-implantitis, an interventional treatment with extraction of implants is used for which type(s) of peri-implantitis, based on the classification by Jovanovic?
   a. Class II.
   b. Class III.
   c. Class IV.
   d. Both b and c.
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8. In the new treatment algorithm for peri-implantitis, bone loss less than _____ without suppuration may be treated by repositioning soft tissues and checking the seal.
   a. 2 to 3 mm.
   b. 3 to 4 mm.
   c. 4 to 5 mm.
   d. None of the above.

9. In cases of mucositis, the first step must be to eliminate the bacterial plaque that may be causing inflammation of the peri-implant tissues.
   a. True.
   b. False.

10. When fabricating prostheses on implants, it is advisable to always select the prosthetic option with the best hermetism. For cemented prostheses, cast posts are a better alternative than micromilled posts.
    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.
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