TiBrush® as an alternative to decontaminate the implant surface: case report

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Abstract: Peri-implant diseases are inflammatory lesions that develop around the tissues that surround osseointegrated dental implants and can be differenced in two entities: peri-implant mucositis (a reversible inflammatory reaction that affects only the soft tissues surrounding the implant in function) and peri-implantitis (an inflammatory reaction associated with loss of supporting bone around the implant in function). High peri-implantitis incidence (28-56% of patients and 12-43% of the implant sites) lead to a growing concern in achieving a guide treatment protocol that promotes the resolution of this disease. Many different treatments are described in the literature but, in spite of some of that interventions can be effective, the level of evidence is, however, limited. The present case report illustrates a treatment option for a peri-implantitis case: decontamination of implant surface with TiBrush® device and guided bone regeneration. After 24 months the patient presented no clinical signs of disease and it was possible to observe in the radiograph the presence of bone around the implant. **Keywords:** Dental implants. Decontamination. Peri-implantitis.

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» The authors report no commercial, proprietary or financial interest in the products or companies described in this article.

» Patients displayed in this article previously approved the use of their facial and intraoral photographs.

INTRODUCTION

Inflammatory lesions affecting the tissues that surround an osseointegrated dental implant are collectively known as peri-implant diseases.[1]

Different definitions of peri-implant diseases had been suggested by several authors. Nowadays, the definition of Zitzman & Berglundh[1] is the most accepted one. According to them, peri-implant diseases are a collective term to define the inflammatory reactions that affects the tissues surrounding the implant in function; peri-implant mucositis is the term used to describe the presence of inflammation in the peri-implant mucosa without any signs of bone loss while peri-implantitis, in addition to mucosal inflammation, embody a loss of support bone.

Recent publications[2] show that peri-implant diseases are common disorders: peri-implant mucositis occurs in 80% of patients rehabilitated with implants and in 50% of the implant sites, while peri-implantitis has been identified in between 28%-56% of individuals rehabilitated with implants and in 12%-43% of the implant sites.

In order to diagnose peri-implant diseases, some parameters should be regularly evaluated:[2,3]

- probing (with a force of 0.25N) is essential in the diagnosis of peri-implant diseases;
- probing must include the assessment of plaque presence, pocket depth, bleeding on probing, and/or suppuration;
- bleeding after probing is indicative of inflammation in the peri-implant mucosa and can be used as a predictive factor in loss of supporting tissues;
- increasing pocket depth over time is associated with loss of insertion and loss of supporting bone;
- the level of the supporting bone around the implant should be evaluated radiographically and compared with baseline (after implant osseointegration).

The successful outcome in the treatment of peri-implant diseases must include parameters that describe the resolution of tissues inflammation and the preservation of the supporting bone. As they are primarily caused by bacteria, associated with other risk factors,[2,3] the removal of the biofilm and the reduction of the risk factors are basic elements in the prevention and treatment of peri-implant disease.[2-5]

Different procedures have been described for the resolution of tissue inflammation and bone defects, including antimicrobial therapy, surface polishing of the implant and regenerative or resective surgical procedures, according to the severity of the disease.[2,3,6] So far, no method has been established as a "golden pattern" for peri-implantitis treatment.[6]

The treatment of peri-implantitis comprises a non-surgical stage that includes debridement by mechanical, ultrasonic or laser instruments used alone or in combination with antiseptic agents and/or antibiotics, and a surgical stage that uses regenerative or resective surgical techniques.[2,3,6,7]

Straumann Tibrush® device was developed to promote the decontamination of dental implants surface affected with peri-implantitis. It is made of titanium bristles with a stainless-steel shaft and must be used with an open flap surgical procedure in order to promote the debridement of the implant surfaces. It is used engaged to a handpiece with refrigeration to avoid the increase of the temperature and the consequent necrosis of the surrounding tissues.

The aim of this article is to describe the use of Straumann Tibrush® device in a peri-implantitis case.

CASE PRESENTATION

The following clinical case illustrates the use of TiBrush® device to clean and decontaminate the implant surface in a situation of peri-implantitis.

In 2009, a 65-year-old female patient presenting type II diabetes and hypertension (the two diseases have been controlled without the use of any systemic drug) was diagnosed a chronic generalized moderate periodontitis that have been treated with scaling and root planning. Since then, the patient has been following a strict periodontal maintenance program that allows the disease control.

In April 2003, a Straumann Bone Level® 3,3x10mm implant was placed at the location of the tooth #25; an ISQ was performed after three months and a cemented provisional crown was placed.

Three months after the crown placement (six months after implant placement) the implant site presents a vestibular probing deep of 10mm (mesial aspect), 12mm (medium aspect) and 9mm (distal aspect), and a palatine probing deep of 11mm (mesial aspect),12mm (medium aspect) and 11mm (distal aspect). The plaque index, gingival index and bleeding on probing index show values in order of 100%; suppuration was clinical observed and bone loss around the implant could be noted trough the x-ray (Fig 1).

In order to promote the resolution of peri-implantitis, it was decided to treat it with a surgical approach, given the efficiency of the technique for decontamination of the implant surface and to promote the regeneration of the defect bone around the implant with a guided bone regeneration technique.

Prior to the surgery, the provisional cemented crown was removed and a cover screw was placed (Fig 2). To control the infection, an antibiotic (Amoxicillin 1g 12/12hours during 8 days) had been prescribed.

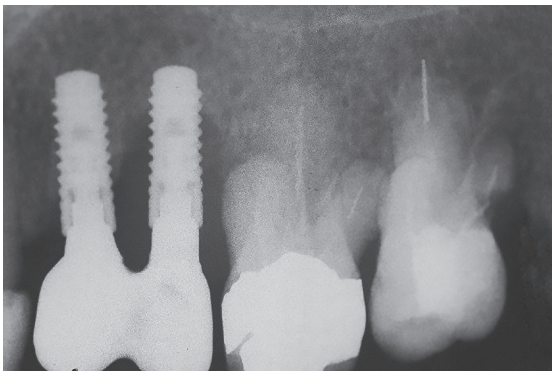

Figure 1: Initial dental X-ray indicated bone lost surrounding the implant 25.

A full thickness flap was open displacing the palatine and the vestibular areas (Fig 3).

First, the removal of the granulation tissue was performed with gracey curettes and TiBrush®device (Fig 4), being the implant surface clean at a macroscopic aspect. Then, the surgical site was cleaned with a saline solution (Fig 5) and antibiotic gel (clorocil®) was applied in the implant surface to complete the surface decontamination (Fig 5). This four steps, gaining access to the infected implant site, initial debridement and debridement with the TiBrush® device and a final cleaning of the implant site, are recommended by the manufacturer (Straumann).[8]

The guided bone regeneration was performed with particulate xenograft (Bio-oss®) (Fig 7) and collagen membrane (Bio-guide®) (Fig 8), and sutured with supramid 4 zeros (B. Braun®) (Fig 9).

Figure 2: Provisional cemented crown removed and placement of a cover screw.

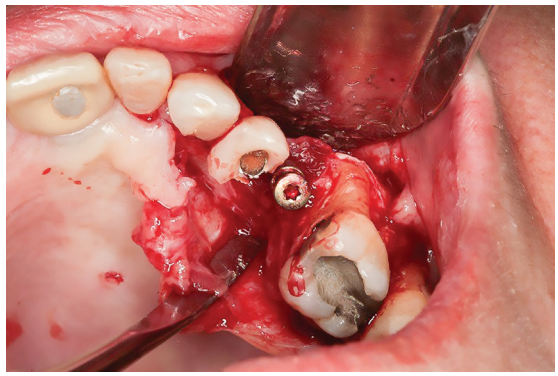

Figure 3: Full thickness flap with displacing the palatine and the vestibular areas.

Figure 4: TiBrush® device.

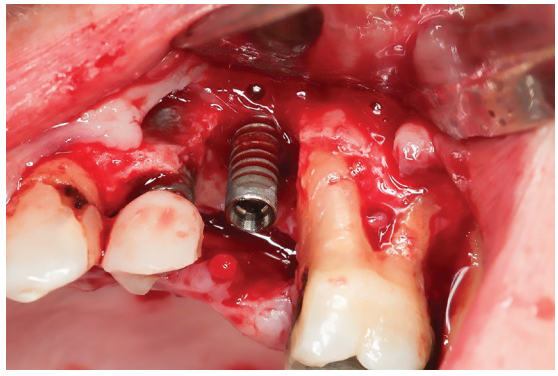

Figure 5: Dental implant aspect after the complete removed of the granulation tissue with gracy curettes and TiBrush®.

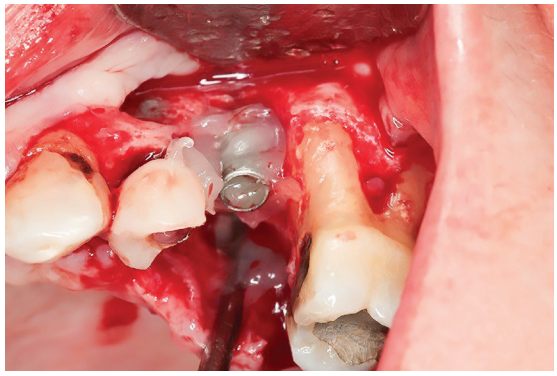

Figure 6: Antibiotic gel (Clorosil®) applied in the implant surfaced.

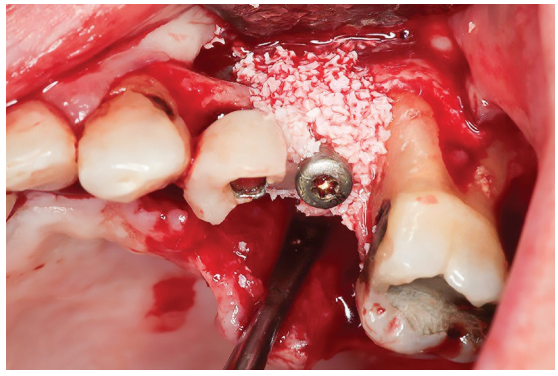

Figure 7: Guided bone regeneration –placing the xenograft particulate (Bio-oss®).

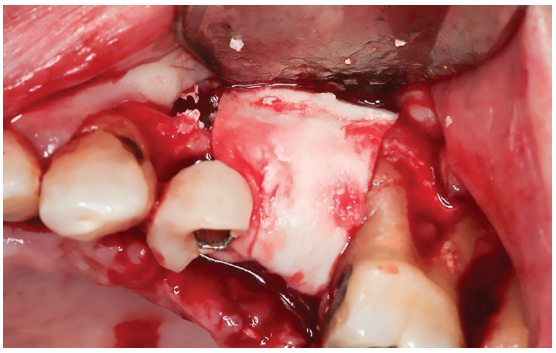

Figure 8: Guided bone regeneration –placing the collagen membrane (Bio-guide®).

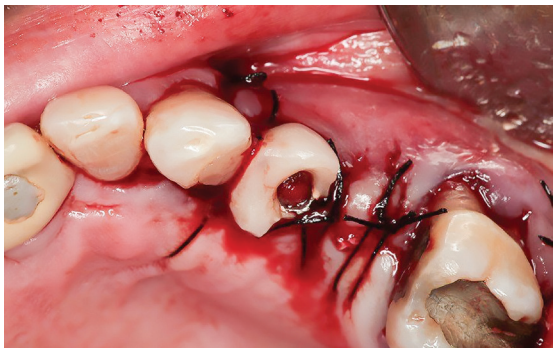

Figure 9: Suture with supramid 4 zeros (B. Braun®).

In the post-op the follow medication was prescribed: amoxicillin and clavulanic acid 875+125mg (Clavamox DT®) 12/12h during 8 days, clonixin 300mg (Clonix®) SOS, ibuprofen 600mg (Brufen®) 12/12h during 5 days and chlorhexidine mouthwash 0,12% (Eludril Perio®) 3 times/day during 10 days. After one week, the suture was removed.

The only post-op complication to relate was an abnormal edema that took around 12 days to completely disappear.

One month after the surgery, two united screw crowns, corresponding to the two pre-molars 24 and 25, have been placed.

The patient has 24 months of follow up without signs of mucositis or peri-implantitis. Healthy periodontal tissues without suppuration (0%), without gingival index or bleeding on probing (0%), a plaque index of 10% and normal pock depth (probing deep in vestibular of 3,4,4 and palatine of 3,3,4) were clinically observed (Fig 10). Radiographically (Fig 11) an image compatible with bone regeneration was observed around the implant.

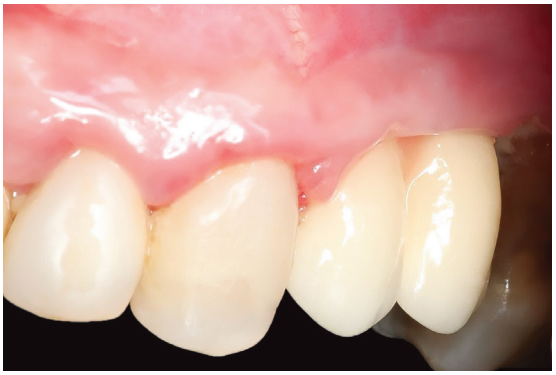

Figure 10: Clinical follow-up image after 24 months of follow-up.

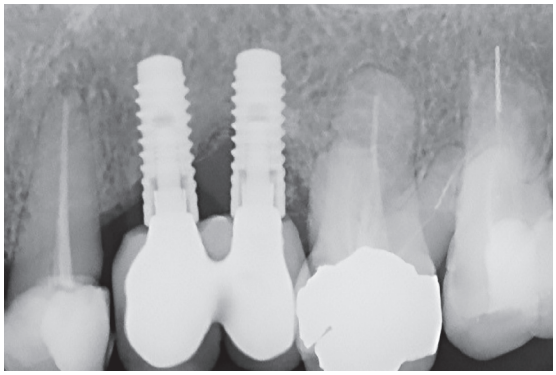

Figure 11: Dental X-ray follow-up after 24 months, presenting an image compatibly with a bone regeneration around of the implant.

DISCUSSION

The success of dental implants depends on the unification between the implant and the bone that surrounds it, as well as on the contact with the surrounding mucosa, that must be free of inflammation,[9] in order to prevent the appearance of peri-implantitis diseases.

Based on the analysis of the peri-implant diseases definitions given by Zitzman & Berglundh,[1] it appears that the differential factor between the two concepts (mucositis and peri-implantitis) is whether or not they cause loss of bone support. That is why it is important to discern between bone remodeling, which occurs shortly after the implant placement, and loss of bone support, which can be detected in implants when the osseointegration process is complete.[1]

The microbial adhesion and accumulation of biofilm have a major role in the pathogenesis of peri-implantitis and the consequent bone loss that can lead to the implant failure.[10,11]

In the literature, some other factors, such as poor oral hygiene, history of periodontitis disease and smoking, have been reported with a high confidence level, as risk factor to the development of peri-implantitis. Other factors, such as diabetes and alcohol consumption present limited evidence, the relationship between genetic factors and implant surface shows limited and conflictual evidence.[2,3]

In three animal studies of Albouy JP, et al.[12-14] it is described that some implant surfaces, especially when they are too rough, are more likely to the develop peri-implantitis than the smooth surfaces or moderated rough surfaces.

In this case, the fast installation of peri-implantitis, 6 months after the implant placement, could be explained by the risk factors (history of chronic periodontitis and diabetes) that the patient presents.

A treatment protocol for the resolution of peri-implantitis is not clear in the literature. Esposito M. et al.[6] in a Cochrane review, reports that "there is very little reliable evidence suggesting which could be the most effective interventions for treating peri-implantitis". The same conclusion is reported in the Consensus Report of the Sixth European Workshop on Periodontology[2] and in the ITI consensus of 2014 entitle the "Consensus Statements and Clinical Recommendations for Prevention and Management of Biologic and Technical Implant Complications."[3]

The goal of the peri-implantitis treatment is to eliminate bacteria but is also important not leaving the surface with features that affect negatively bone regeneration and likely a re-osseointegration,[15] especially if we also pretend to do guided bone regeneration. Decontamination of the exposed surface is considered mandatory for the successful treatment of peri-implantitis.[16]

However, the removal of biofilm from implant surface is more difficult than from teeth because of the specificities of surface and it´s geometry.[17] The ergonomic shape of the instruments used for that purpose is essential for the cleaning success.

The effect of different mechanical means used to the decontamination of the implant surface have been subject to several studies to verify their cleaning efficiency, the alterations that they can produce to implant surface and how these could affect the biocompatibility of the implant.[4,15,18]

Chloramphenicol (clorocil®) was used with the TiBrush® device to help the decontamination. In the literature, the microorganisms most frequently isolated from aggressive periodontitis[19] are highly susceptible to this antibiotic, because of his broad spectrum killing activity

against anaerobes bacteria.[20] Other study reports chloramphenicol killed 90% of the strains of Capnocytophaga.[21]

TiBrush® is a single use brush comprised of titanium bristles and stainless steel shaft, which is coupled to the counter angle to promote mechanical decontamination of the implant surface. TiBrush® has an easier form (relative to other traditional means of mechanical decontamination) of cleaning the granulation tissue around the implant, giving to the implant a macroscopic clean aspect.

In the in vitro study of Jonh G. et al,[17] that evaluates the effectiveness of plaque removing with TiBrush® when compared with steel curettes, it was observed that TiBrush® was more effective in plaque removing. The study concluded that TiBrush® seems to be an effective instrument for mechanical cleaning procedure of SLA with no surface alteration shown so far.

Another in vitro study of Gustumhaugen E. et al.[22] compares the effect of chemical debridement alone with the combination of chemical and the use of TiBrush® for the debridement of titanium surfaces inoculated with Staphylococcus epidermidis. It was observed that the combining treatment provided a best reduction in biofilm mass and re-growth.

In the clinical case presented, we can observe radiographically bone regeneration around the implant after the treatment. We presume that the modifications in implant surface produce by the TiBrush® do not affect negatively the bone regeneration. To be sure of this hypothesis a bone biopsy would be necessary.

It is important that the clinician never forget the importance of regular probing (0.25N), the assessment of presence of plaque, pocket depth, bleeding on probing and/or suppuration in order to diagnostic the peri-implant diseases. If bleeding on probing and/or suppuration and augmentation of probing depth are present, is mandatory take an x-ray to evaluate the levels of the supporting bone around the implant and compare with the clinical measurements and baseline radiography.[2,3]

CONCLUSION

Based on clinical and radiological aspects, we can conclude that the treatment of peri-implantitis has been successfully achieved, with a follow up of 24 months. This success lead us to infer that the necessary conditions for the treatment of this pathology (decontamination of the implant surface and possible bone defect regeneration) were achieved with the methodology adopted: surface decontamination with TiBrush® device and guided bone regeneration.

TiBrush® device allows an easier and ergonomic way of cleaning the granulation tissue that was adhered to the implant surface.

In order to draw conclusion regarding to the most effective action protocol for the treatment of peri-implantitis, it is important to conduct more well designed RCT with well-defined action protocols.

It is essential for the clinician never forget the importance of the regular check-up after the implant rehabilitation to avoid the appearance of peri-implant diseases.

References:

1. Zitzmann NU, Berglundh T. Definition and prevalence of peri-implant diseases. J Clin Periodontol. 2008 Sept;35(8 Suppl):286-91.
2. Lindhe J, Meyle J, Group D of European Workshop on Periodontology. Peri-implant diseases: Consensus Report of the Sixth European Workshop on Periodontology. J Clin Periodontol. 2008 Sept;35(8 Suppl):282-5.
3. Heitz-Mayfield LJ, Needleman I, Salvi GE, Pjetursson BE. Consensus statements and clinical recommendations for prevention and management of biologic and technical implant complications. Int J Oral Maxillofac Implants. 2014;29 Suppl:346-50.
4. Klinge B, Gustafsson A, Berglundh T. A systematic review of the effect of anti-infective therapy in the treatment of peri-implantitis. J Clin Periodontol. 2002;29 Suppl 3:213-25; discussion 232-3.
5. Renvert S, Roos-Jansåker AM, Claffey N. Non-surgical treatment of peri-implant mucositis and peri-implantitis: a literature review. J Clin Periodontol. 2008 Sept;35(8 Suppl):305-15.
6. Esposito M, Grusovin MG, Worthington HV. Interventions for replacing missing teeth: treatment of peri-implantitis. Cochrane Database Syst Rev. 2012 Jan 18;1:CD004970.
7. Kotsovilis S, Karoussis IK, Trianti M, Fourmousis I. Therapy of peri-implantitis: a systematic review. J Clin Periodontol. 2008 July;35(7):621-9.
8. Institut Straumann AG. Step-by-step Instructions on the Straumann® TiBrush. Switzerland: Straumann; 2011.
9. Bürgers R, Gerlach T, Hahnel S, Schwarz F, Handel G, Gosau M. In vivo and in vitro biofilm formation on two different titanium implant surfaces. Clin Oral Implants Res. 2010 Feb;21(2):156-64.
10. Scarano A, Piattelli M, Caputi S, Favero GA, Piattelli A. Bacterial adhesion on commercially pure titanium and zirconium oxide disks: an in vivo human study. J Periodontol. 2004 Feb;75(2):292-6.
11. Elter C, Heuer W, Demling A, Hannig M, Heidenblut T, Bach FW, et al. Supra- and subgingival biofilm formation on implant abutments with different surface characteristics. Int J Oral Maxillofac Implants. 2008 Mar-Apr;23(2):327-34.
12. Albouy JP, Abrahamsson I, Berglundh T. Spontaneous progression of experimental peri-implantitis at implants with different surface characteristics: an experimental study in dogs. J Clin Periodontol. 2012 Feb;39(2):182-7.
13. Albouy JP, Abrahamsson I, Persson LG, Berglundh T. Spontaneous progression of peri-implantitis at different types of implants. An experimental study in dogs. I: clinical and radiographic observations. Clin Oral Implants Res. 2008 Oct;19(10):997-1002.
14. Albouy JP, Abrahamsson I, Persson LG, Berglundh T. Spontaneous progression of ligatured induced peri-implantitis at implants with different surface characteristics. An experimental study in dogs II: histological observations. Clin Oral Implants Res. 2009 Apr;20(4):366-71.
15. Mombelli A. Microbiology and antimicrobial therapy of peri-implantitis. Periodontol 2000. 2002;28:177-89.
16. Louropoulou A, Slot DE, Van der Weijden FA. Titanium surface alterations following the use of different mechanical instruments: a systematic review. Clin Oral Implants Res. 2012 June;23(6):643-58.
17. John G, Becker J, Schwarz F. Rotating titanium brush for plaque removal from rough titanium surfaces--an in vitro study. Clin Oral Implants Res. 2014 July;25(7):838-42.
18. Schmage P, Kahili F, Nergiz I, Scorziello TM, Platzer U, Pfeiffer P. Cleaning effectiveness of implant prophylaxis instruments. Int J Oral Maxillofac Implants. 2014 Mar-Apr;29(2):331-7.
19. Ogunsalu C, Daisley H, Akpaka PE. Prevalence and antimicrobial susceptibility pattern of pathogens isolated from patients with juvenile periodontitis in Jamaica: a prospective multi-centre study of 15 cases over a 15-year period. West Indian Med J. 2011 Mar;60(2):235-9.
20. Baker PJ, Evans RT, Slots J, Genco RJ. Susceptibility of human oral anaerobic bacteria to antibiotics suitable for topical use. J Clin Periodontol. 1985 Mar;12(3):201-8.
21. Goumas PD, Naxakis SS, Papavasiliou DA, Moschovakis ED, Tsintsos SJ, Skoutelis A. Periapical abscesses: causal bacteria and antibiotic sensitivity. J Chemother. 1997 Dec;9(6):415-9.
22. Gustumhaugen E, Lönn-Stensrud J, Scheie AA, Lyngstadaas SP, Ekfeldt A, Taxt-Lamolle S. Effect of chemical and mechanical debridement techniques on bacterial re-growth on rough titanium surfaces: an in vitro study. Clin Oral Implants Res. 2014 June;25(6):707-13.