



## ***Treatment of Periimplantitis with minimally invasive approach and antimicrobial photodynamic therapy - Case report.***

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### **Case Report**

#### **ABSTRACT**

Periimplantitis is the most common biological complication on implant dentistry. Its prevalence is estimated of 20% of the successfully osseointegrated implants. The treatment of this complication has been a subject of great discussion in the past years. It is well accepted that non-surgical treatment has little or no effectiveness on stopping progressive bone loss and surgical treatment might be mandatory to achieve disease control. Some authors have proposed the use of Guided Bone Regeneration to regain the bone lost due to disease progression, similarly to periodontal regenerative therapies. Recently, the use of a minimally invasive surgical technique has shown promising regenerative results, without the use of biologics. The aim of this case report is to describe the use of a minimally invasive surgical technique to treat progressive bone loss around implant. A 68-year-old Caucasian female with deep pocket and infrabony defect on an implant at #14 region was treated with a minimally invasive surgical flap and decontamination with antimicrobial photodynamic therapy after removal of provisional restoration. Primary closure was achieved with 6-0 polypropylene sutures, and the healing process was uneventful, and radiographic outcomes were favorable up to 12 months. This case report shows that good regenerative outcomes can be achieved when primary closure, minimal invasiveness, and tissue stability are achieved by a surgical technique.

**Keywords:** Dental Implants, Aesthetic Zone, Dentistry.

## ***Tratamento de Periimplantite com abordagem minimamente invasiva e terapia fotodinâmica antimicrobiana - Relato de caso.***

### **RESUMO**

A peri-implantite é a complicação biológica mais comum na implantodontia. Sua prevalência é estimada em 20% dos implantes osseointegrados com sucesso. O tratamento dessa complicação tem sido objeto de grande discussão nos últimos anos. É amplamente aceito que o tratamento não cirúrgico tem pouca ou nenhuma eficácia em interromper a perda óssea progressiva e o tratamento cirúrgico pode ser obrigatório para alcançar o controle da doença. Alguns autores propuseram o uso da Regeneração Óssea Guiada para recuperar o osso perdido devido à progressão da doença, de forma semelhante às terapias regenerativas periodontais. Recentemente, o uso de uma técnica cirúrgica minimamente invasiva tem mostrado resultados regenerativos promissores, sem o uso de agentes biológicos. O objetivo deste relato de caso é descrever o uso de uma técnica cirúrgica minimamente invasiva para tratar a perda óssea progressiva ao redor do implante. Uma mulher caucasiana de 68 anos com bolsa profunda e defeito infraósseo em um implante na região #14 foi tratada com um retalho cirúrgico minimamente invasivo e descontaminação com terapia fotodinâmica antimicrobiana após a remoção da restauração provisória. O fechamento primário foi obtido com suturas de polipropileno 6-0, e o processo de cicatrização transcorreu sem intercorrências, com resultados radiográficos favoráveis em até 12 meses. Este relato de caso demonstra que bons resultados regenerativos podem ser alcançados quando o fechamento primário, a invasividade mínima e a estabilidade tecidual são alcançados por meio de uma técnica cirúrgica.

**Palavras-chave:** Implantes Dentários, Zona Estética, Odontologia.

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## ***INTRODUCTION***

According to the most recent World Workshop jointly organized by the American Academy of Periodontology and the European Federation of Periodontology (AAP/EFP), peri-implantitis is defined as a plaque-associated pathological condition occurring in tissues around osseointegrated dental implants. It is characterized by inflammation of the peri-implant mucosa and progressive loss of supporting bone [1]. Evidence suggests that peri-implantitis may begin within the first three years following prosthetic loading [2].

The treatment of peri-implantitis has been extensively investigated over recent decades; however, no universally accepted gold standard protocol has been established to date. Given the infectious nature of the disease, most treatment strategies aim to decontaminate the implant surface through mechanical and chemical methods. Antimicrobial photodynamic therapy (aPDT), which involves the application of a photosensitizing agent followed by light activation, has demonstrated efficacy in reducing microbial load on both dental implants and natural teeth [3].

Peri-implantitis has been linked to various local and systemic factors. Among the local contributors, excess cement in the peri-implant sulcus has been identified as a significant risk factor [4]. Extruded cement particles may act as foreign bodies, promote chronic inflammation and contribute to the onset of infection and subsequent bone loss [3-5].

To address the bone loss associated with peri-implantitis, guided bone regeneration (GBR) has been proposed, particularly in contained defects where the presence of surrounding bone walls facilitates defect fill through cell migration and osteogenesis [5]. However, recent preclinical studies have questioned the additional benefit of GBR in experimentally induced peri-implant defects, suggesting that achieving primary wound closure may be more critical than the use of biomaterials or biologics for promoting bone regeneration [6].

A recent clinical study employing a minimally invasive flap design with or without the use of biomaterials reported excellent regenerative outcomes, even in the absence of grafting materials [7]. These findings reinforce the importance of a minimally invasive

surgical approach and achieving optimal primary closure, as previously emphasized [8].

The aim of this case report is to present a 1-year clinical and radiographic outcome of the treatment of a peri-implantitis lesion using a minimally invasive surgical technique combined with antimicrobial photodynamic therapy.

## **CASE REPORT**

A 68-year-old Caucasian female presented with a deep periodontal pocket and an infrabony defect associated with a dental implant in the maxillary left first molar region (#14). The implant-supported single crown had been in function for five years and exhibited chipping. The crown was removed and replaced with a provisional restoration. Prior to taking the final impression, significant peri-implant inflammation with suppuration was observed (Figure 1), and extensive bone loss was confirmed by analog radiography (Figure 2).

The patient was informed of the need for surgical intervention to manage the progressive bone loss around the implant. After obtaining informed consent, the treatment was initiated. As an initial step, non-surgical therapy was performed, including mechanical debridement using an ultrasonic tip (Figure 3).

Surgical access was achieved using a minimally invasive flap design (Figure 4). Implant surface decontamination was performed with titanium curettes and antimicrobial photodynamic therapy (aPDT), consisting of the application of 10 mg/mL methylene blue with a 5-minute pre-irradiation time, followed by copious saline irrigation. A red laser (660 nm, 45 mW/cm<sup>2</sup>) was then applied for 60 seconds to both buccal and palatal interproximal surfaces, delivering an energy density of 60 J/cm<sup>2</sup> per site.

A provisional crown was trans-surgically cemented to ensure proper seating and to prevent excess cement extrusion (Figure 5a). The flap was closed with 6-0 polypropylene sutures (Micropoly® 6-0, Microsuture, São Paulo, Brazil) (Figure 5b). Postoperative care included 200 mg ibuprofen as needed for pain control and 0.12% chlorhexidine mouth rinse twice daily until suture removal, which occurred 14 days after surgery (Figure 5c). The patient reported no need for analgesic medication during the early or late postoperative periods. Healing was uneventful.

The patient returned for follow-up evaluations at 1, 3, 6, and 12 months postoperatively. Absence of clinical signs of inflammation and progressive bone fill were noted, with radiographic confirmation of bone regeneration as early as 3 months (Figure 6) and maintained at 12 months (Figure 7).

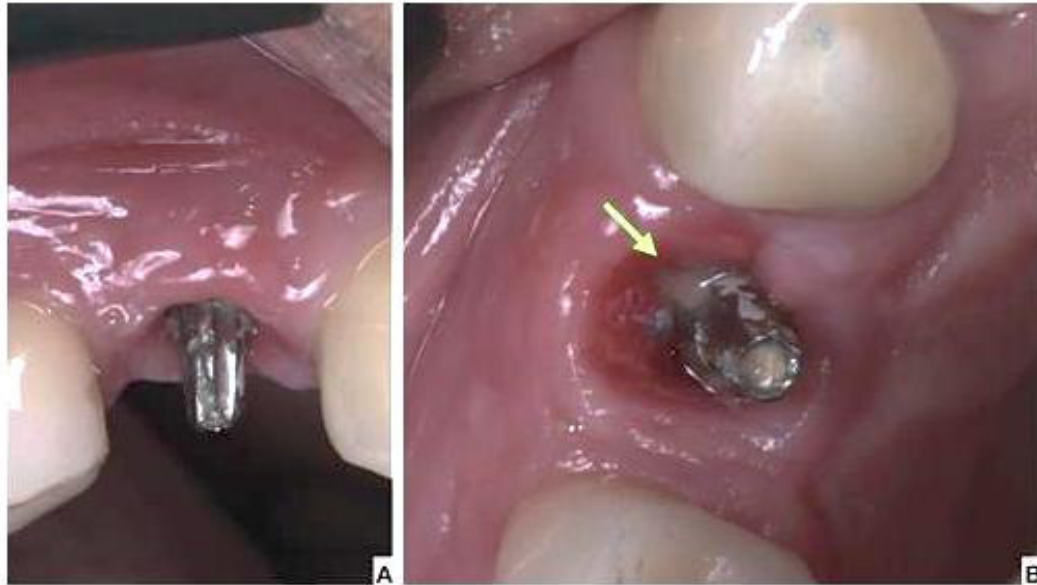


Figure 1 - Before; Clinical situation before treatment, mucosal inflammation associated with suppuration trough the sulcus (green arrow).



Figure 2 - X ray image before treatment showing extensive bone loss.

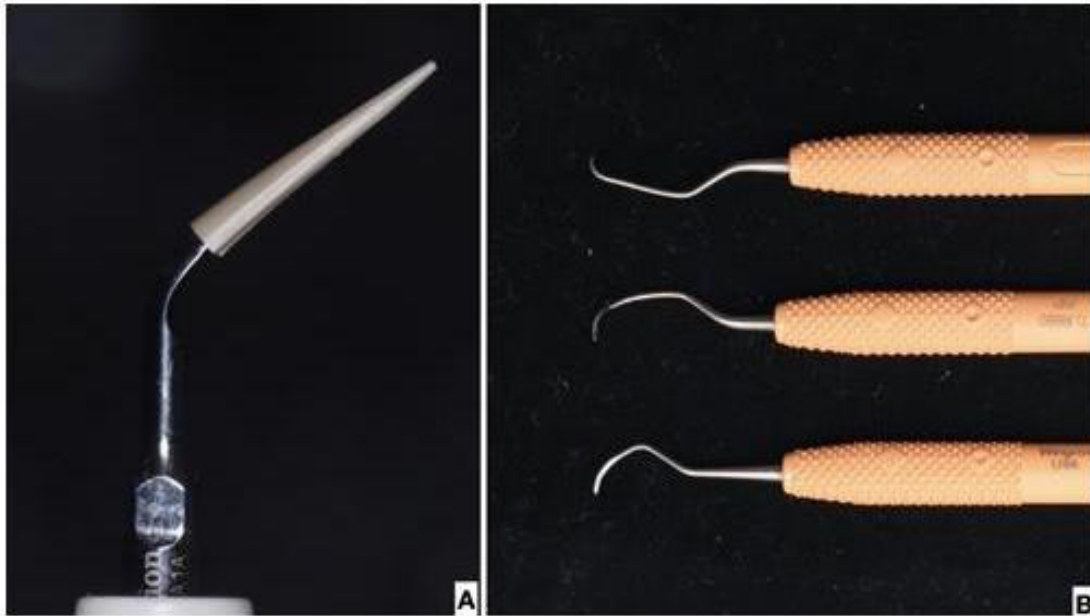


Figure 3 – A) Ultrasonic tip (Scorpion cLip®) B) Titanium curettes used for the debridement of the tissue and implant surface.



Figure 4 - Flap design According to Aslan et al., 2020. Minimal vertical incision maintaining papillae untouched with a minimally invasive access to the defect. Trans-surgical image of the granulation tissue before its removal.

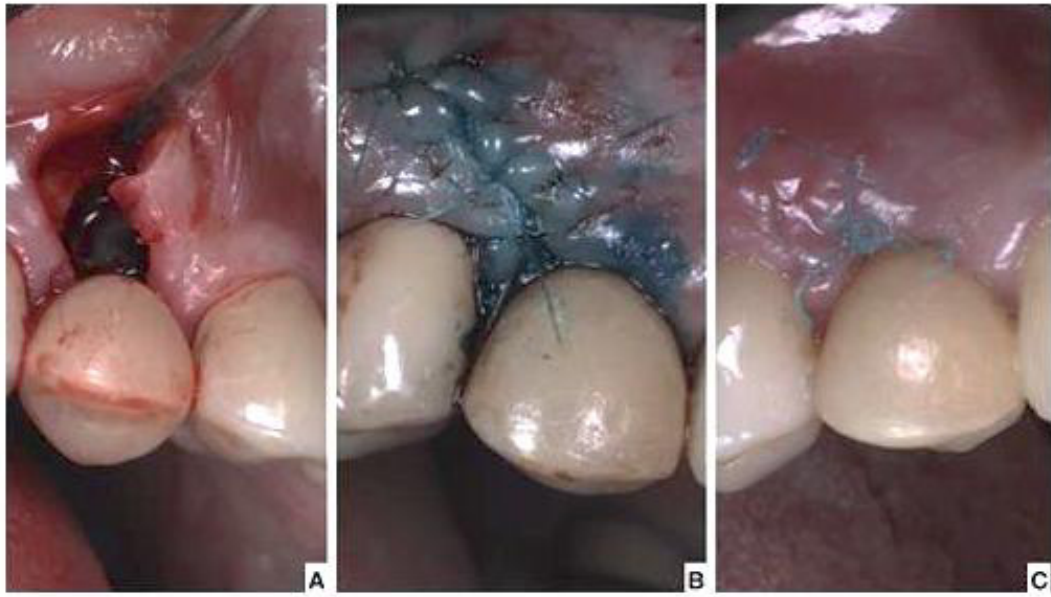


Figure 5 – A) surgical aspect of the minimally invasive incision/approach after removal of granulation tissue; B) Immediate post-operative aspect; C- Sutures before its removal at 14 days post operative.



Figure 6 - Clinical aspect after 3 months.



Figure 7 - After A- Clinical aspect after 12 months without sign of inflammation or augmented probing pocket depth B- x ray aspect after 12 months of treatment.

## **DISCUSSION**

To the best of our knowledge, this is the first relevant case report to apply a minimally invasive surgical approach originally developed for periodontal regeneration to the treatment of peri-implantitis lesions. The results confirm the efficacy of this technique in managing peri-implantitis. Historically, surgical treatment of peri-implantitis has been based on well-established mechanical debridement and regenerative protocols derived from periodontal therapy [9], and chemical decontamination methods have followed a similar path [10,11].

In this case, we employed a modified antimicrobial photodynamic therapy (aPDT) protocol in combination with mechanical debridement for implant surface decontamination. Our approach was based on a previously published preclinical study [6], but with an increased laser dose to enhance the antibacterial effect. The effectiveness of aPDT relies on two main factors: accurate bacterial targeting and adequate light activation. The bactericidal effect is directly proportional to light exposure time, as the photosensitizer does not exert an antibacterial effect in the

absence of light.

Minimally invasive surgical techniques have been widely explored in periodontal literature for decades [12], with continuous evolution aimed at preserving the papillae and minimizing interproximal tissue shrinkage. This includes the development of papilla preservation flaps, which have demonstrated excellent clinical and esthetic outcomes [7,13,14]. The surgical technique used in this case report was originally described in 2017 [15], initially incorporating biologic materials. A subsequent randomized clinical trial compared outcomes with and without the use of biomaterials [7].

Avoiding the use of biologics can reduce chair time and treatment costs, contributing to improved patient-centered outcomes. At 1- and 4-year follow-up, a slight loss of buccal volume was observed, although the patient did not express any esthetic concerns. This collapse may be attributed to the absence of a buccal bone wall (Figure 5) and represents a potential limitation of the technique. In such cases, a soft tissue graft could be considered to improve contour and enhance the overall outcome.

## **FINAL CONSIDERATIONS**

This case report demonstrates that a minimally invasive surgical approach, originally developed for periodontal regeneration, can be effectively adapted to treat peri-implantitis lesions. The combination of mechanical debridement with a modified antimicrobial photodynamic therapy protocol showed favorable clinical and radiographic outcomes after one year. By avoiding the use of biomaterials, the technique reduces treatment time and costs, offering a patient-centered solution. Despite minor buccal volume loss likely due to the absence of a buccal bone wall the overall results support the feasibility and efficacy of this conservative approach in selected peri-implant cases.

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## DATA AVAILABILITY

All data analyzed during this study are available from the corresponding author upon reasonable request.

## DISCLAIMER OF LIABILITY AND DISCLOSURE

All data analyzed during this study are available from the corresponding author upon reasonable request. The authors report no conflicts of interest regarding any of the products or companies discussed in this article.

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