CASE REPORT

Successful management of advanced peri-implantitis with guided bone regeneration: A case report with a 2-year follow-up

Gulnar Dara Sethna, Rajesh Prabhakar Gaikwad, Rajat Nahar[1], Satish Sudhakar Gadai[2], Noopur Subhash Narayane[3]

ABSTRACT

Dental implants play a pivotal role in the rehabilitation of missing teeth and have been revolutionary in the field of dentistry. However, clinical and biological complications may be associated with dental implants and may occur primarily due to bacterial infection in the soft and hard tissue around the implants. These are known as peri-implant mucositis and peri-implantitis. Management of peri-implant and peri-apical infections, so as to achieve re-osseointegration of the exposed implant surfaces, is often challenging for the treating dentist. Various treatment modalities of peri-implant diseases include nonsurgical and surgical therapy. This case report describes successful management and a 2-year follow-up of a case of advanced peri-implantitis using a protocol that involves thorough debridement, decontamination, and guided bone regeneration.

KEY WORDS: Decontamination, dental implant, doxycycline, guided bone regeneration, peri-implantitis

INTRODUCTION

During the last two decades, dental implants have become a viable and effective mode of rehabilitation of esthetics and compromised oral function resulting from tooth loss. Due to the exponential growth of the global market for dental implants, there is a commensurate increase in the number of implant-related complications. According to the consensus report of workgroup 4 of the 2017 World Workshop on the Classification of Periodontal and Peri-implant Diseases and Conditions,[1] peri-implant diseases generally present as peri-implant mucositis and peri-implantitis. Diagnosis of peri-implant mucositis is based on the criteria of the presence of peri-implant signs of inflammation (redness, swelling, or bleeding within 30 s after probing), combined with no additional bone loss following the initial healing. Peri-implantitis can be diagnosed clinically based on the criteria of peri-implant signs of inflammation with radiographic evidence of bone loss following initial healing and an increased probing depth (PD) compared with the PD after the placement of the prosthetic reconstruction. In the absence of the previous radiographs, a radiographic bone level ≥3 mm accompanied with bleeding on probing (BOP) and PD ≥6 mm is indicative of peri-implantitis.[2] According to the 11th European Workshop on Periodontology, the

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prevalence of peri-implant mucositis and peri-implantitis is 43% and 22%, respectively.[3] A study by Wang *et al.*[4] suggests that one in four patients who receives dental implants is more likely to suffer from a peri-implant disease at some point in their life. The primary goal of the treatment of peri-implantitis is to address and eliminate peri-implant mucosal inflammation, and to achieve healthy hard and soft peri-implant tissues.[5]

Various treatment modalities have been advocated in the treatment of peri-implant diseases; these include conservative therapies such as mechanical debridement with titanium or carbon curettes with an adjunct of local or systematic antibiotics, lasers, ultrasonic devices, and photodynamic therapy.[6] Surgical techniques include the use of bone substitutes, decontamination of implant surfaces, or resective surgeries. This case report describes successful management and a 2-year follow-up of a case of advanced peri-implantitis using a protocol that involves thorough debridement, decontamination, and guided bone regeneration (GBR).

CASE REPORT

A 45-year-old female was referred to the Department of Periodontology, Government Dental College and Hospital, Mumbai, with a dull aching pain from an implant site in the mandibular posterior region. Full-mouth rehabilitation with implants was done 10 years ago in a different dental office. The patient was a nonsmoker with no existing comorbidities and in good general and periodontal health.

On clinical examination of the area of chief complaint, two implants (Osstem) with internal hex connections were seen with splinted cement-retained prosthetic restorations in mandibular right first and second molars (tooth # 46, 47). The patient presented with deep peri-implant PD in the implant site # 47, which ranged from 8 to 10 mm with the presence of BOP. Exudation could be expressed when the peri-implant tissues were palpated; however, there was no mobility seen in the implants. An orthopantomogram revealed bone loss of approximately 50% of the implant length on implant site # 47 [Figure 1]. According to the Proceedings of the World Workshop on the Classification (2017) of Periodontal and Peri-implant Diseases and Conditions,[1] a diagnosis of peri-implantitis was made.

The cone-beam computed tomography (CBCT) revealed a Class III b defect, which consisted of 2–3 walled defects with horizontal bone loss (classification based on the morphology of the defect), at implant site #47 [Figure 2]. Based on the severity of the defect depth and ratio of bone loss/total implant length, it was classified as a case of advanced peri-implantitis.[7]

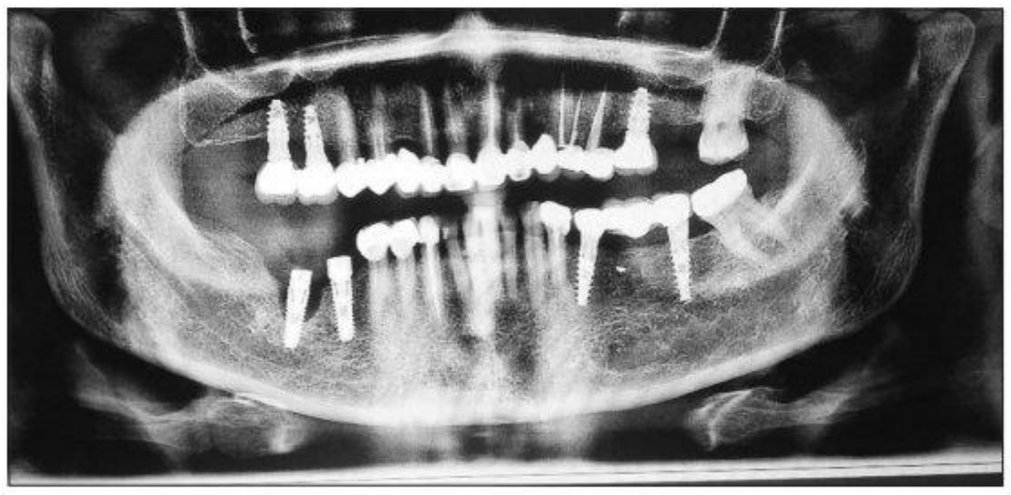

Figure 1: Preoperative orthopantomogram

No bone loss was observed in the neighboring implant site #46.

The patient had failed to do a follow-up with her treating dentist and hence had no radiographs, which could document the progressive bone loss since the implant restoration. Nonsurgical and surgical treatment options were meticulously discussed with the patient, and a written informed consent form for the same was obtained before treatment.

The nonsurgical procedure consisted of thorough scaling and root planing with titanium-coated curettes and the patient was instructed to rinse with 10 ml of 0.2% chlorhexidine twice daily for 15 days. Meticulous oral hygiene instructions were given to manage plaque accumulation and the use of interdental cleaning aids such as Waterpik and interdental brushes was reinforced. Clinical assessment of PD and BOP was done after 6 weeks; there was a marked reduction in gingival inflammation.

Surgical technique

Surgery to access the peri-implant defect was performed 2 months following the nonsurgical treatment. The prosthetic supraconstruction was removed; under local anesthesia (1:100 000 epinephrine), surgical access to the bone defect was obtained by reflecting a full-thickness mucoperiosteal flap buccally and lingually. Clinically, there was extensive horizontal and vertical bone loss with 5–6 implant threads exposed on the implant site # 47 [Figure 3]. Thorough degranulation of the peri-implant defect was done with the help of titanium-coated curettes [Figure 4]. A titanium brush (TN-Brush, Dentium) was used with thorough saline irrigation at 800 revolutions per min with light pressure and at an angle of approximately 45°–60° to the implant surface to mechanically decontaminate the implant surface [Figure 5]. The implant surface was then detoxified with multiple applications of a slurry of 100-mg doxycycline hyclate powder and sterile water, which was applied with a microbrush for 60 s, and rinsed thoroughly with saline. After thorough debridement at the surgical site, decortication was performed to promote

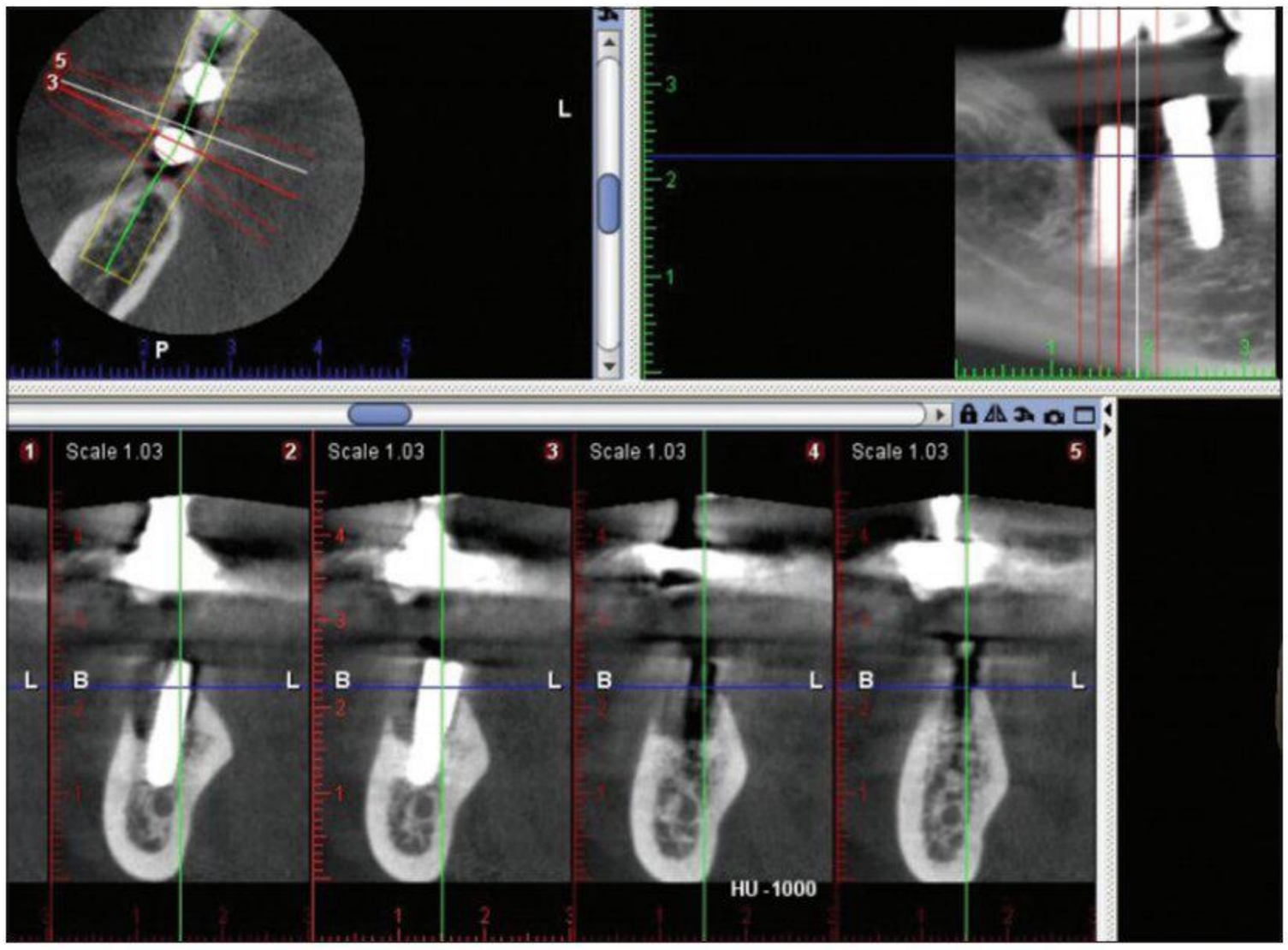

Figure 2: Preoperative cone-beam computed tomography

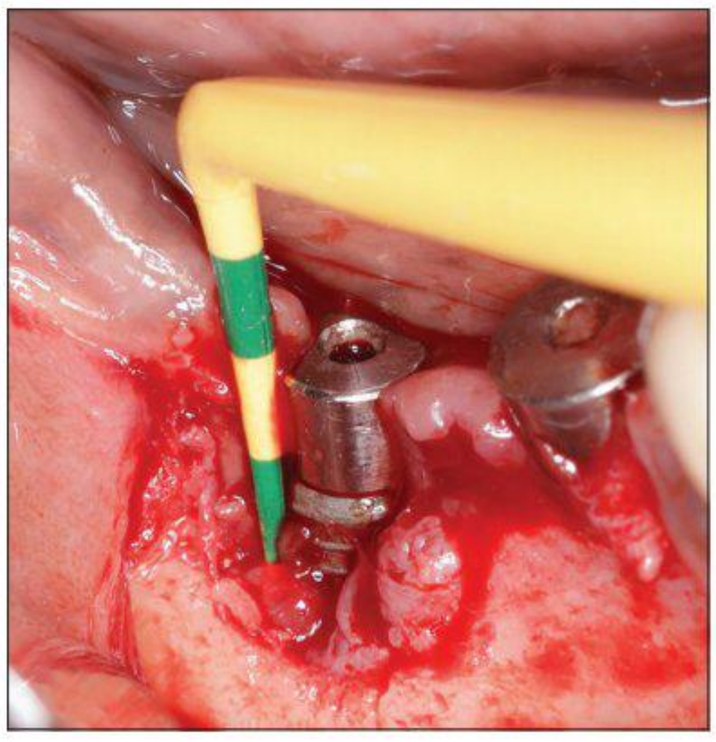

Figure 3: Clinical view of the defect after flap reflection shows horizontal and vertical bone loss

osteogenesis [Figure 6]. After final irrigation, a cover screw was placed and the peri-implant defect was grafted with 1 cc of 0.25–1 mm particulate size, highly porous, and organic porcine xenograft (MinerOss XP, Biohorizons, USA). A 15 mm × 20 mm bioresorbable porcine collagen membrane (MatrixDerm, NovaBone Products Pvt. Ltd) was trimmed and adapted over the defect site and placed over the grafting material [Figure 7]. To achieve primary wound closure, the flap was repositioned and sutured with a 4-0 synthetic absorbable monofilament surgical suture (Monosyn®). Systemic antibiotic therapy consisted of 625 mg of amoxicillin and clavulanate thrice daily for 7 days which was commenced a day before surgery.

An immediate postoperative radiograph revealed a satisfactory filling of the defect with the augmented bone graft [Figure 8]. The suture removal was done 14 days after the surgery with uneventful postoperative healing. The patient was instructed to gently dab the surgical site with a local application of 0.12% chlorhexidine solution twice daily and to avoid flossing and brushing at the surgical site for 2 weeks.

Prosthetic loading phase

A healing abutment was placed on implant site # 47 after 4 months; the PD around the healing abutment had reduced considerably (4–5 mm) with no BOP. This was followed by re-fabrication of cemented crowns on implant sites # 46 and #47 [Figure 9]. The patient was diligently monitored with regular quarterly oral hygiene maintenance visits. A 2-year follow-up revealed healthy soft-tissue conditions with no BOP and PD of approximately 4–5 mm around the surgical site and no mobility of implant #47. Radiographically, the CBCT indicated bone regeneration and complete bony defect fill at the level of the second implant thread [Figure 10].

DISCUSSION

Bacterial biofilm on implant surfaces plays a major role in etiology of peri-implantitis; hence, the goal of treatment is to control bacterial infection and peri-implant inflammation by either surgical or nonsurgical treatment. However, unlike periodontitis, progression of the

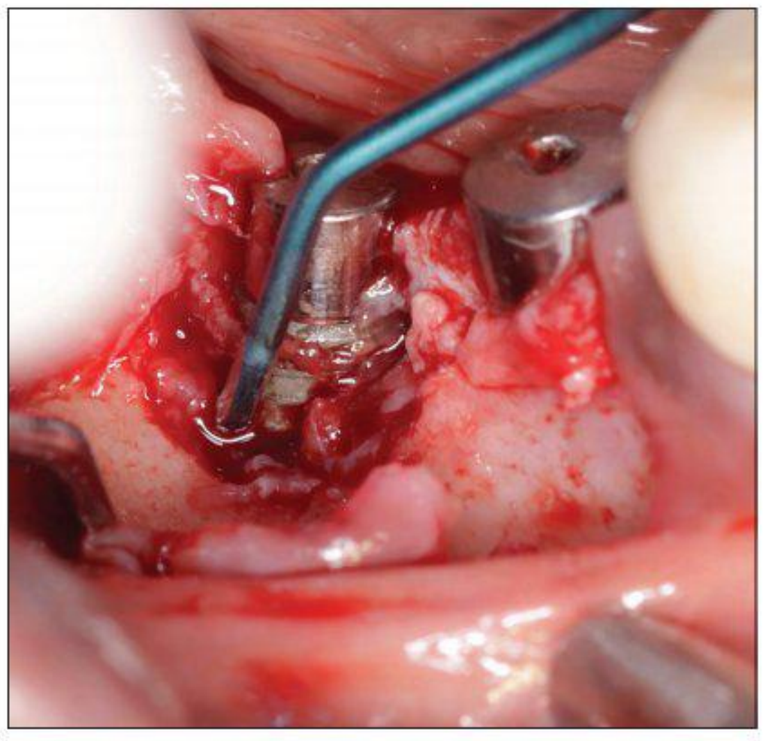

Figure 4: Degranulation of the osseous defect done with a titanium-coated curette

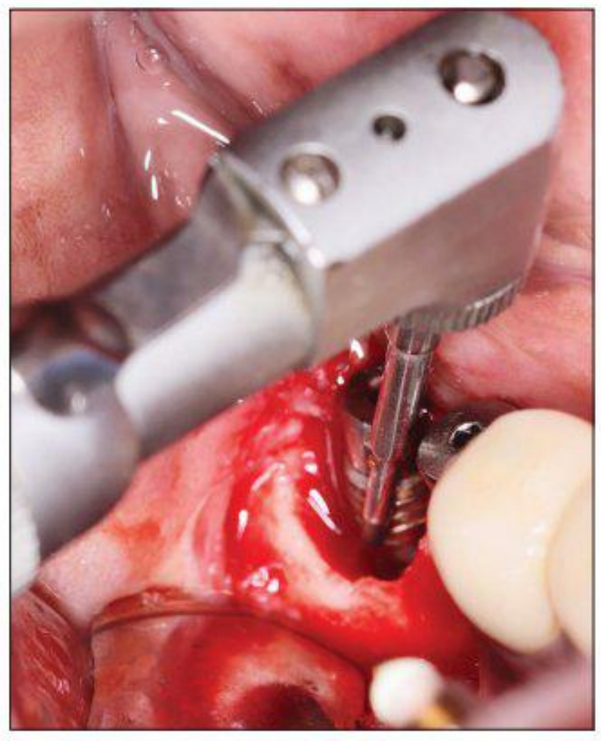

Figure 5: Mechanical decontamination of implant surface was done with a titanium brush (TN-Brush, Dentium)

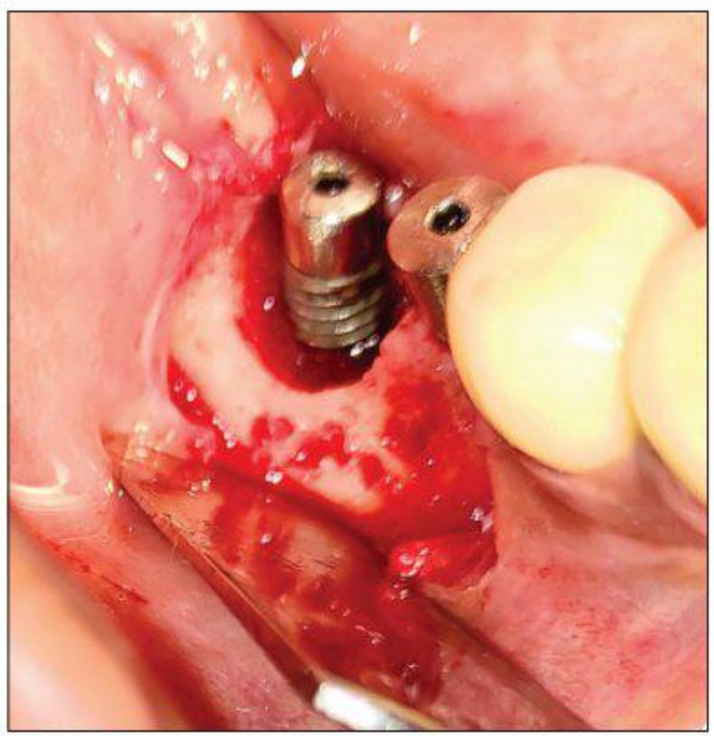

Figure 6: Decortication at the surgical site

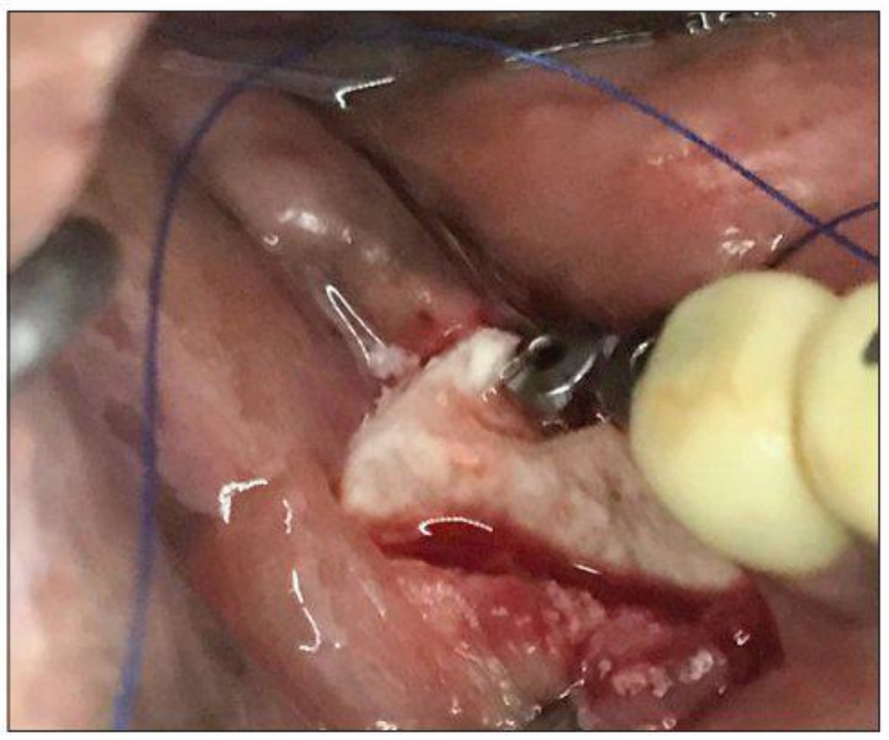

Figure 7: Guided bone regeneration was done with a porcine xenograft. (MinerOss XP, Biohorizons, USA) and a 15 mm × 20 mm bioresorbable porcine collagen membrane. (MatrixDerm, NovaBone Products Pvt. Ltd)

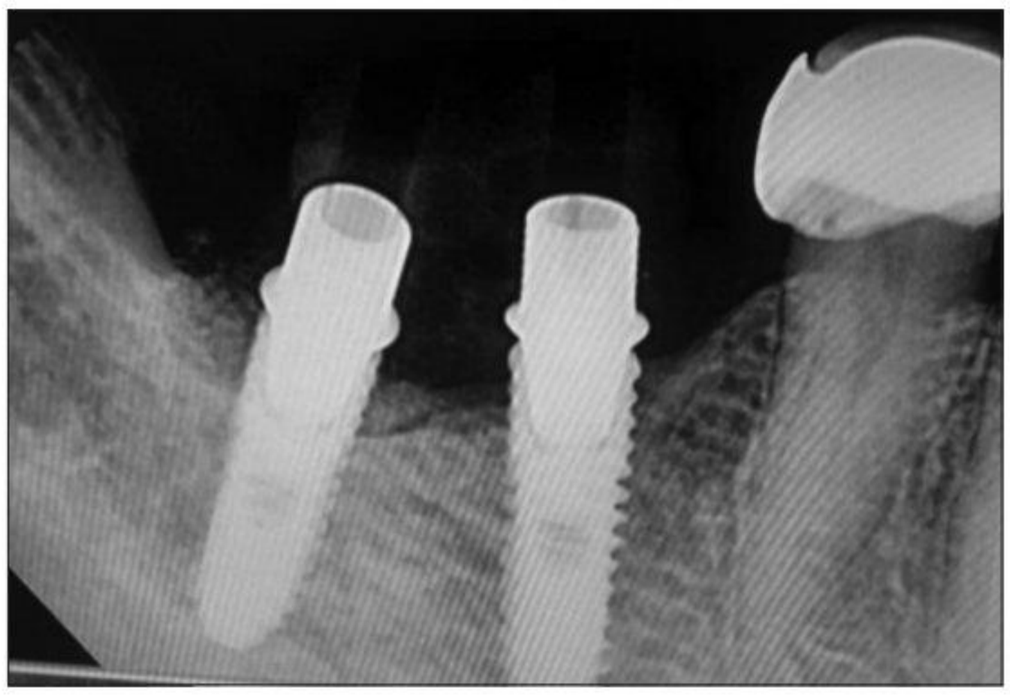

Figure 8: Immediate postoperative IOPA

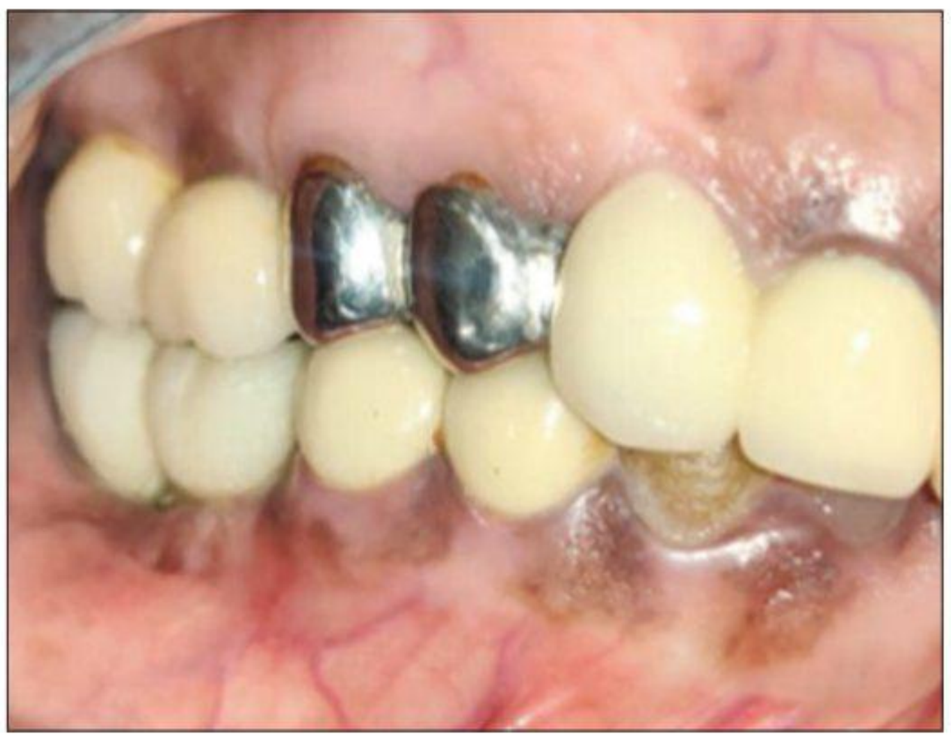

Figure 9: PFM crowns on implant site #46 and #47

peri-implantitis lesion is much faster and has a more unpredictable response to both surgical and nonsurgical treatments.[8] It is primarily attributed to diminished vascularization and parallel orientation of the collagen fibers in peri-implant tissues.[9] If undiagnosed, peri-implantitis may lead to the complete failure of osseointegration and implant loss.[8]

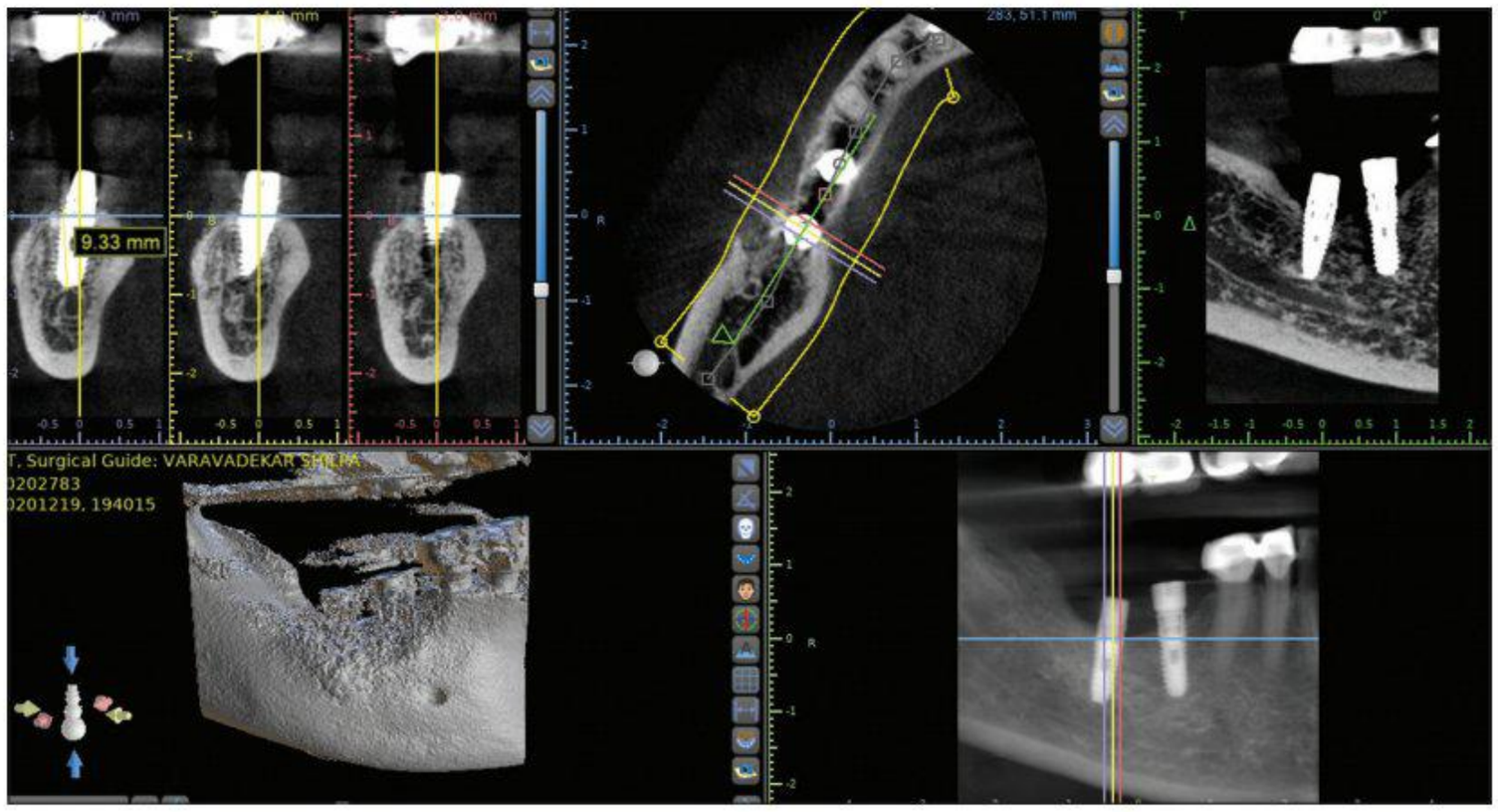

Figure 10: Postoperative cone-beam computed tomography done after 2 years

Nonsurgical treatment remains the cornerstone of periodontal therapy; however, the available data suggest that nonsurgical therapy was effective for peri-implant mucositis but may not be effective for the treatment of peri-implantitis and has a high tendency for recurrence.[10]

The consensus report of working group 3 of the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions[11] suggests that nonsurgical treatment of peri-implantitis usually provides clinical parameters such as BOP (20%–50% reduction) and in some cases PD reduction (≤1 mm). However, it may not bring about complete resolution of the disease in advanced cases. Surgical therapy is therefore the treatment of choice for the management of peri-implantitis. These include open flap debridement of the implant surface, resective surgery, implantoplasty, and regenerative therapy with bone substitutes and barrier membranes.[12] Jin *et al.*[13] in an *in vitro* study suggested that peri-implantitis irreversibly deteriorates the biocompatibility of implants; however, they concluded that treated titanium-coated implant surfaces had improved cytocompatibility as compared to the untreated contaminated implant surfaces. Hence, decontamination of implant sites as an adjunct to surgical regenerative plays an indispensable role in the treatment of peri-implantitis. In our case report, both mechanical decontamination and chemical decontamination of implant surfaces before surgical regenerative therapy were achieved with a titanium brush (TN-Brush, Dentium) and doxycycline slurry, respectively.

In a randomized, double-blinded clinical trial by de Tapia *et al.*,[14] the additional use of a titanium brush during regenerative treatment of peri-implantitis resulted in statistically significant benefits in terms of PD reduction after 12 months. Similarly, some authors have reported favorable results in BOP and PD when doxycycline was used for decontamination of implant surfaces during surgical treatment of a peri-implant defect.[15]

Despite a large number of studies available, there is a lack of consensus regarding standardized treatment protocols for peri-implantitis. Koo *et al.*[16] in a review of the literature concluded that all the materials and tools used for surface decontamination of implant surface for treating peri-implantitis failed to show any clinical difference over the long term regardless of the implant surface. This was primarily due to recontamination by the oral flora.

A consensus report on surgical treatment of peri-implantitis (2019) stated that surgical augmentative therapy for peri-implantitis resulted in favorable radiographic and clinical outcomes.[17] Autogenous bone is generally considered as the "gold standard" of bone grafting materials since it combines osteoconductive, osteoinductive, and osteogenic characteristics with the absence of immunological reactions.[18] However, some studies have concluded that that autogenous bone grafts have approximately 40% volume reduction during the healing process as compared to synthetic bone substitutes, which retain their volume for years.[19] Synthetic or xenogenic materials display superior volume stability with a minimal resorption rate. Hence, it may be prudent to combine a mixture of materials to combat the disadvantages of autogenous grafts.[20]

A study by Schwarz *et al.* indicated that reconstructive surgery with the use of xenografts and collagen membranes gave superior results in terms of PD reduction and clinical attachment level gain.[21] This is similar to our case report where a porcine xenograft (MinerOss XP) was used along with a bioresorbable porcine collagen membrane (MatrixDerm®).

There is disagreement regarding the role of barrier membranes in regenerative surgical techniques for the treatment of peri-implantitis. A systematic review by Chan *et al.*[22] had concluded that there was a greater reduction in PD and BOP in patients when bone graft and membranes were used together compared to bone grafts alone in the treatment of peri-implantitis. This differs from the study by Roos-Jansåker *et al.*, which stated that there were no additional benefits to using barrier membranes.[23] It is the present authors' opinion that the use of bioresorbable membrane had enhanced peri-implant bone regeneration by virtue of providing an undisturbed graft remodeling. However, a consensus report based on four background reviews stated that there is no evidence in the literature to support the superiority of a specific material, product, or membrane in terms of long-term treatment outcome.[17]

CONCLUSION

A rational and evidence-based approach is required for the optimal management and treatment of peri-implantitis. This case report highlights the successful management of a case of advanced peri-implantitis following anti-infective therapy and GBR. It is important to emphasize that early detection and treatment of mucositis and peri-implant bone loss along with good patient compliance are the keys to long-term clinical and functional success of implant-supported restorations.

Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given her consent for her images and other clinical information to be reported in the journal. The patient understands that name and initials will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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