Successful treatment of peri-implantitis with GalvoSurge® dental implant cleaning system

Impact of advanced surgical techniques on tissue health

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In this case report, we present a successful management of peri-implantitis using an alternative biofilm removal approach in combination with guided bone regeneration (GBR) in a posterior implant, as described by Renvert and Giovannoli.[1] This treatment not only resolved clinical symptoms but also regenerated lost peri-implant bone, resulting in a favourable long-term prognosis.

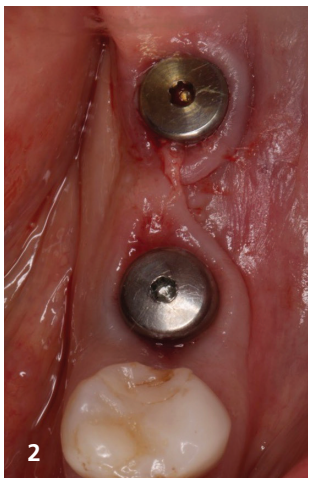
Peri-implant diseases, especially peri-implantitis, have become a significant and prevalent complication in implant dentistry.[1] With the increasing number of dental implant procedures, the incidence of peri-implantitis is also on the rise. This condition is characterised by inflammation and progressive bone loss surrounding dental implants, which can lead to potential implant failure and serious oral health issues.[2]

The primary trigger for peri-implantitis is the accumulation of bacterial biofilms on implant surfaces, leading to inflammation and subsequent alveolar bone loss. Traditional therapies, including non-surgical mechanical debridement, antimicrobial agents, and surgical interventions, have been utilised to arrest or reverse the progression of peri-implantitis; however, these conventional methods often have limitations.[3] GalvoSurge® offers an alternative biofilm removal approach for peri-implantitis. This dental implant cleaning system employs an innovative electrolytic cleaning method that promotes aseptic conditions and facilitates tissue regeneration around dental implants.[4]

Initial situation

A 66-year-old female patient, classified as ASA I and a non-smoker with no documented medication history or allergies, presented to our clinic in 2020 with complaints of pain and food impaction associated with one of her posterior dental implants. The patient reported maintaining regular follow-up appointments with her general dentist and had not previously undergone any peri-implant therapeutic interventions.

Upon conducting a comprehensive clinical and radiographic examination, dental implant #37 was diagnosed with peri-implantitis, in accordance with the diagnostic criteria established at the 2017 World Workshop on the Classification of Periodontal and Peri-Implant Diseases and Conditions.[6] This diagnosis was substantiated by clinical indicators including bleeding on probing, increased probing depths, and significant circumferential peri-implant bone loss surrounding the affected implant.



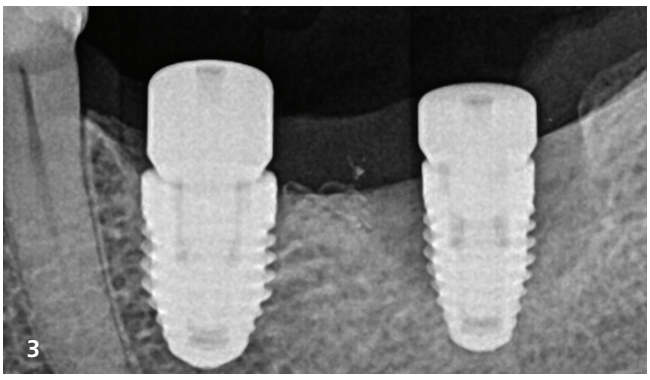


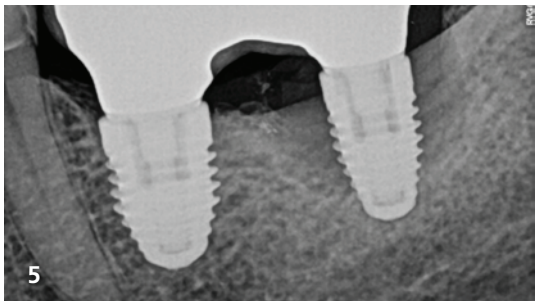
Fig. 1: Conservative treatment approach with prosthesis removed. **Fig. 2:** Healing abutments positioned for tissue adaptation. **Fig. 3:** Radiograph of implants placed in positions #36 and #37.

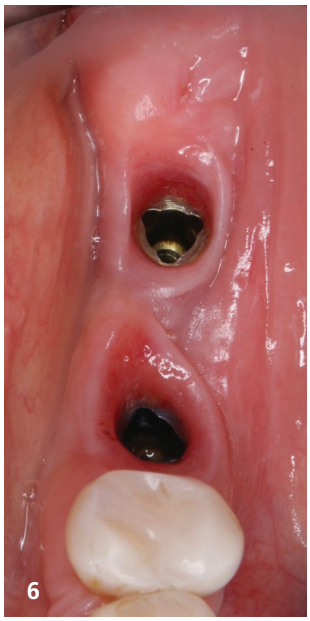
Treatment planning

Following a detailed discussion of the potential treatment options with the patient, alongside a thorough assessment of associated risks and contraindications, we decided to initiate a non-surgical intervention to mitigate inflammation, subsequently followed by a surgical procedure incorporating guided bone regeneration (GBR) using GalvoSurge®. This innovative technology has shown substantial efficacy in the removal of bacterial biofilm from dental implants compromised by peri-implantitis, thereby facilitating a meticulous decontamination of the exposed implant surface and preparing it for re-osseointegration.

The initial phase involved conservative treatment, wherein the prosthetic restoration was removed, and healing abutments were placed (Figs. 1 & 2). Non-surgical mechanical debridement was performed utilising standard ultrasonic instruments and an air flow device. This was supplemented by irrigation with chlorhexidine 0.12% and metronidazole at a concentration of 5 mg/ml, followed by the application of a local antibiotic solution enriched with hyaluronic acid. Post-procedural radiographs were obtained for implants located in positions #36 and #37 after the healing abutments were screwed in place (Fig. 3).

After several weeks, the prosthetic restoration was reattached, and the patient was enrolled into a maintenance programme featuring regular follow-up appointments. During each visit, the patient exhibited good compliance, with no indications of plaque accumulation, bleeding on probing, or signs of inflammation. Consequently, a comprehensive evaluation of all clinical parameters was conducted, and it was deemed appropriate to proceed with the surgical phase of treatment.





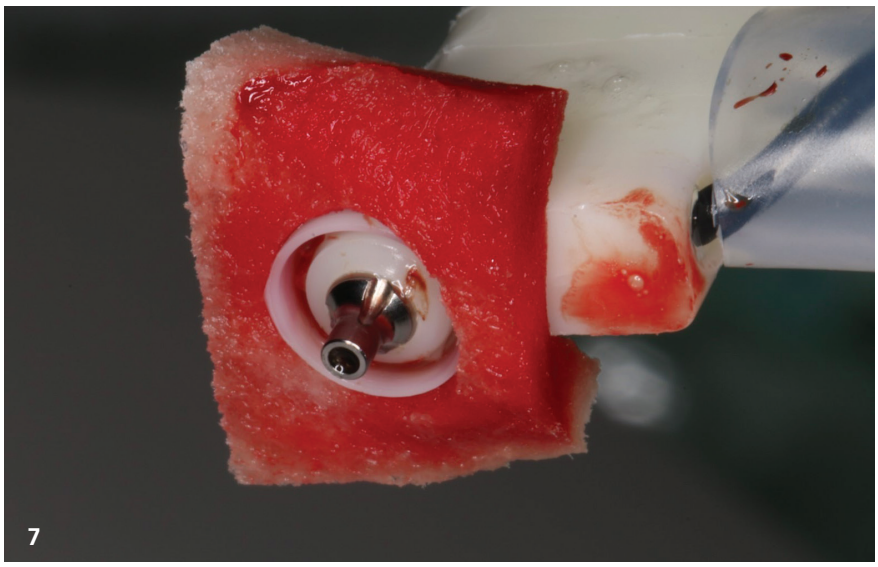
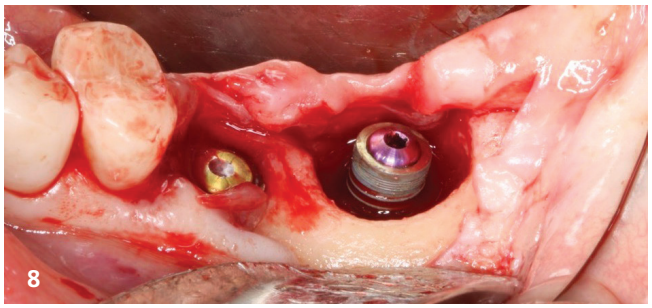


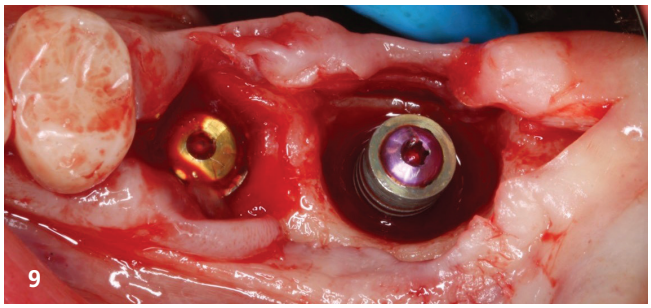
Fig. 4: Clinical reevaluation prior to surgical intervention. **Fig. 5:** Preoperative radiograph conducted before surgery. **Fig. 6:** Fixed prosthesis removed to facilitate access to the surgical site. **Fig. 7:** GalvoSurge® spray head equipped with a sponge to maintain maximum contact of the cleaning solution with the implant surface.

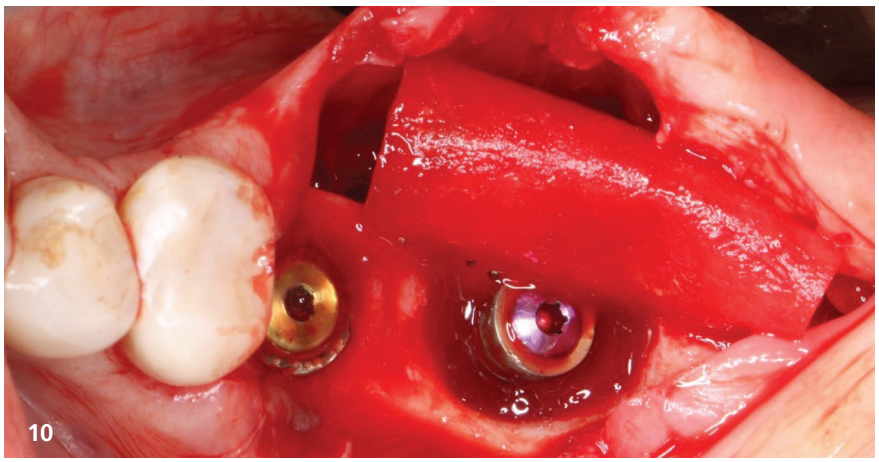
Surgical procedure

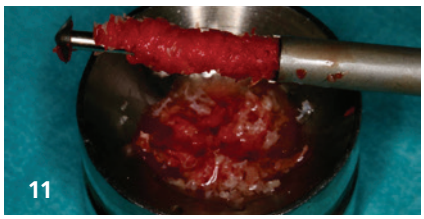
Prior to surgery, a comprehensive re-evaluation was conducted (Figs. 4 & 5). The fixed prosthesis was first removed (Fig. 6), after which the patient rinsed with a 0.12 % Chlorhexidine gluconate solution, and local anaesthesia was administered using 2 % lidocaine with 1:100,000 epinephrine. A full-thickness mucoperiosteal flap was then elevated through an intrasulcular and crestal incision. The bone defect was subsequently assessed and classified as a Class I infra-bony defect based on the modified classification system described by Renvert and Giovannoli.[5] This classification, indicating the presence of all four bony walls, deemed the defect suitable for guided bone regeneration (GBR), aiming to restore both functional and aesthetic outcomes.

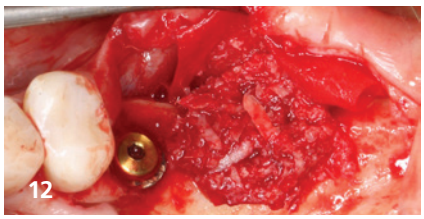
After the removal of the closure caps, the implants underwent a thorough cleaning and disinfection process using 0.12 % Chlorhexidine (CHX) solution and the GalvoSurge® device, with non-metallic suction applied throughout. The patient was advised about the potential for a salty taste from the cleaning solution, as well as the likelihood of increased liquid flow

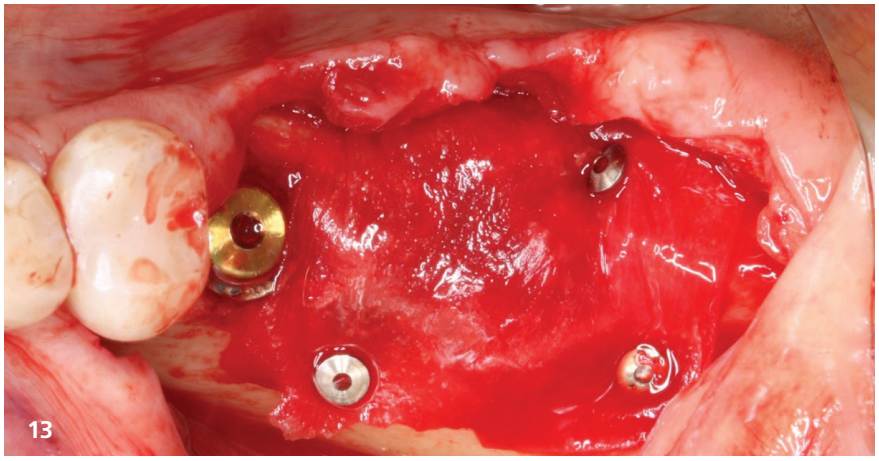


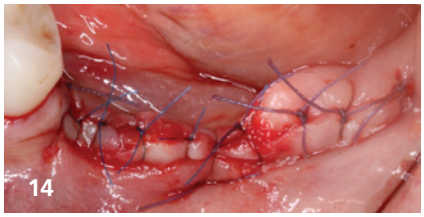












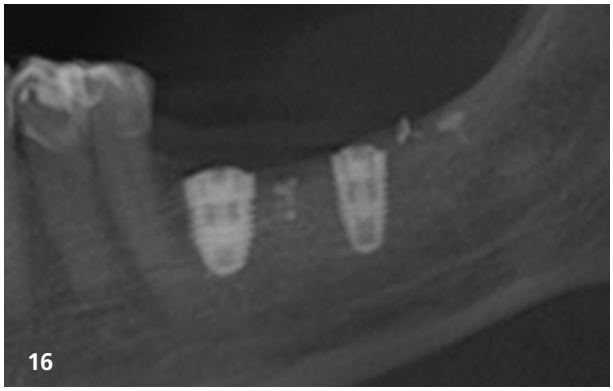


Fig. 8: Implant surface after electrolytic cleaning with GalvoSurge®, showing a clean and decontaminated surface. **Fig. 9:** Closure caps reinserted to protect the implant site. **Fig. 10:** Straumann® Membrane Flex positioned and secured with fixation pins. **Fig. 11:** Autogenous bone chips collected and mixed with botiss maxgraft® granules for grafting. **Fig. 12:** PRF combined with bone chip granules for application to the defect site. **Fig. 13:** Straumann® Membrane Flex secured with pins, providing soft tissue-support and containment of the graft material. **Fig. 14:** Suturing completed with 4/0 Vicryl and 6/0 Prolene for wound closure. **Fig. 15:** Clinical view ten days postoperatively, prior to suture removal. **Fig. 16:** Six-month follow-up demonstrating optimal bone levels surrounding the implants. **Fig. 17:** Control tomo-graphy taken after six months of healing.

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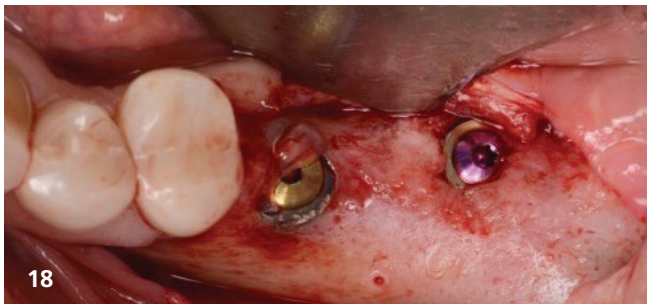

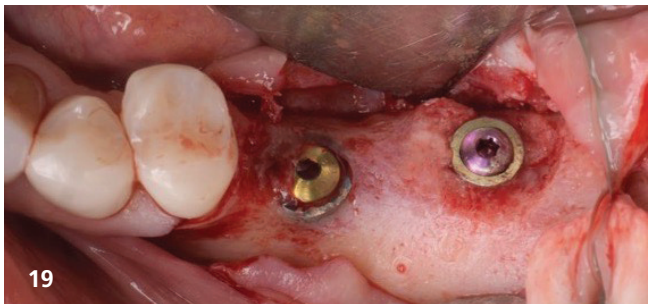

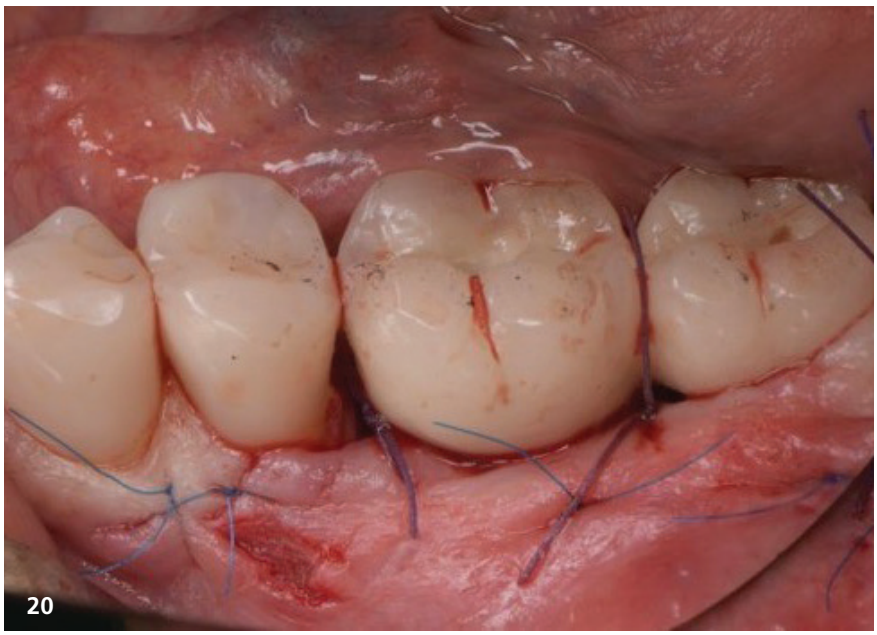

Fig. 18: Flap elevated to access and remove residual excess bone from the healing abutment. **Fig. 19:** Clinical situation following removal of excess bone around the healing abutment. **Fig. 20:** Prosthesis reattached to its designated position post-treatment. **Fig. 21:** Follow-up visit ten days post-procedure, with the clinical situation evaluated. **Fig. 22:** Clinical evaluation at the 2021 follow-up, showing maintained tissue health.

into the oral cavity during the procedure. The solution would be promptly suctioned to minimise discomfort.

The electrolytic cleaning process began by placing the spray head over the implant and inserting the Implant connector into its interior. Once the device was activated, gentle pressure was applied to the spray head to ensure optimal contact. The sponge component on the spray head was designed to maximise the retention of the cleaning solution around the implant surface during the entire procedure, enhancing cleaning efficiency and effectiveness (Fig. 7).

The presence of hydrogen bubbles during the cleaning confirmed the effective application of the GalvoSurge® system. Over the two-minute cleaning duration, these bubbles formed beneath the biofilm, lifting it from the implant surface and facilitating a thorough decontamination of the implant.

Upon completing the cleaning, the area surrounding the implant, as well as beneath the flap, was rinsed with sterile saline to remove any remaining coagulum or solution residues. Once the implant surface was verified as clean, the closure caps were reinserted (Figs. 8 & 9), marking the beginning of the guided bone regeneration (GBR) procedure. The GBR process involved securing a Straumann® Membrane Flex over the site with fixation pins (Fig. 10). Autogenous bone chips were collected and mixed with botiss maxgraft® granules (Fig. 11). This bone graft mixture was then mixed with PRF and applied to the defect (Fig. 12). To support the soft tissue and ensure graft containment, the Straumann® Membrane Flex was pinned in place over the graft (Fig. 13).

Suturing was performed using 4/0 Vicryl and 6/0 Prolene sutures to promote optimal tissue adaptation. Additionally, postoperative oral hygiene instructions were provided to the patient (Fig. 14). Ten days later, the patient returned for suture removal and wound evaluation. The healing process was uneventful, and the wound showed a satisfactory progression (Fig. 15).

After a six-month healing period, a follow-up tomography was performed, revealing optimal bone levels around the implants (Figs. 16 & 17). A flap was then elevated to access and remove any residual excess bone from the healing abutment area (Figs. 18 & 19). Closure of the incision was achieved using 4/0 Vicryl and 6/0 Prolene sutures to ensure a se-

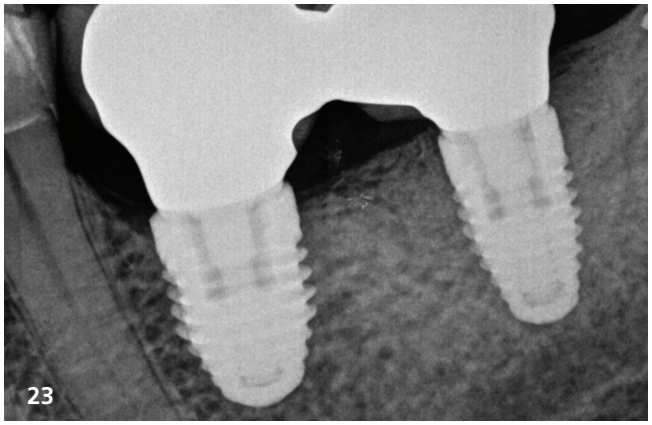

Fig. 23: Radiographic assessment at the 2021 follow-up visit, with no complications noted.

Fig. 24: Clinical stability and favourable outcome observed at the 2022 follow-up.

Fig. 25: Follow-up visit in 2023 indicating continued stability and no biological complications observed.

cure and effective wound closure. The prosthetic component was then carefully reattached and secured in its designated position (Fig. 20).

Ten days later, the patient returned for a follow-up assessment, during which a thorough evaluation of the treatment site was conducted. At this visit, the sutures were carefully removed, and a radiograph was taken to assess the ongoing healing and integration at the treatment site. The patient expressed satisfaction with the results, indicating a successful and favourable response to the procedure (Fig. 21).

Treatment outcomes

During follow-up visits in 2021 (Figs. 22 & 23), 2022 (Fig. 24), and 2023 (Fig. 25), no biological or radiographic complications were found. These evaluations confirmed excellent health in both hard and soft tissues, showcasing the effectiveness of the surgical approach. The GalvoSurge® system and guided bone regeneration (GBR) significantly contributed to these outcomes, emphasising the importance of these advanced techniques in achieving optimal patient results and long-term stability.

Author's testimonial

For years, I struggled to achieve effective bone regeneration in peri-implantitis defects and thought it was impossible. However, my perspective changed after incorporating GalvoSurge® into my treatment protocol. I realised that surface disinfection is crucial, and it significantly enhances biofilm control. Additionally, adopting conservative treatment methods, addressing influencing factors, and utilising the GBR protocol for vertical bone augmentation are essential considerations for success.

References

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