

Metal-free rehabilitation with bioactive glass-ceramic implants

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Biological dentistry has gained increasing interest among patients seeking metal-free alternatives because of concerns regarding biocompatibility and overall health.

This case report describes the comprehensive rehabilitation of a female patient in her thirties with longstanding food-related allergy-like symptoms and chronic gastrointestinal manifestations who requested complete metal-free dental treatment. The treatment included orthodontic aligner correction to establish functional occlusion, atraumatic removal of a failing titanium implant, extraction of a compromised root canal-treated tooth, placement of two zirconia dental implants, and definitive zirconia restorations. Healing was uneventful, with excellent aesthetic and functional outcomes. During follow-up, the patient reported a marked improvement in her overall well-being, including significant reduction in food-related allergy-like symptoms and chronic skin manifestations. Although these observations represent patient-reported outcomes and do not establish causality, this case demonstrates the successful application of comprehensive biological rehabilitation using bioactive glass ceramic implants and highlights the importance of documenting patient-centered outcomes.

Introduction

The demand for biological dentistry and metal-free rehabilitation has increased considerably in recent years. Many patients seek treatment that minimises the use of metallic biomaterials while emphasising minimally invasive procedures, preservation of healthy tissues, and restoration using highly biocompatible materials.

Zirconia implants have emerged as a promising alternative to conventional titanium implants because of their excellent aesthetic properties, favourable soft-tissue response, and metal-free composition. While titanium remains the gold standard for implant dentistry, selected patients actively request ceramic implants based on personal preferences, previous experiences, or concerns regarding metal sensitivity.

This case report presents the comprehensive rehabilitation of a patient who sought biological dental treatment involving replacement of a titanium implant and a root canal-treated tooth with bioactive glass ceramic dental implants, followed by complete metal-free prosthetic rehabilitation. Meridian® implants are fabricated from a proprietary bioactive glass ceramic rather than conventional zirconia. This non-metallic biomaterial is primarily composed of silicon dioxide (SiO₂), calcium oxide (CaO), magnesium oxide (MgO), sodium oxide (Na₂O), and potassium oxide (K₂O). The bioactive composition has been developed to support favourable bone and soft-tissue integration while maintaining the strength required for implant rehabilitation.

Case presentation

A female patient in her thirties, herself a medical doctor, presented to our clinic seeking treatment based on the principles of biological dentistry.

She reported a three- to four-year history of food-related allergy-like symptoms

together with recurrent dermatological manifestations that significantly affected her quality of life. According to the patient, these symptoms began after previous dental treatment involving a titanium implant and a root canal-treated tooth. Despite multiple medical consultations and allergy investigations, her symptoms persisted.

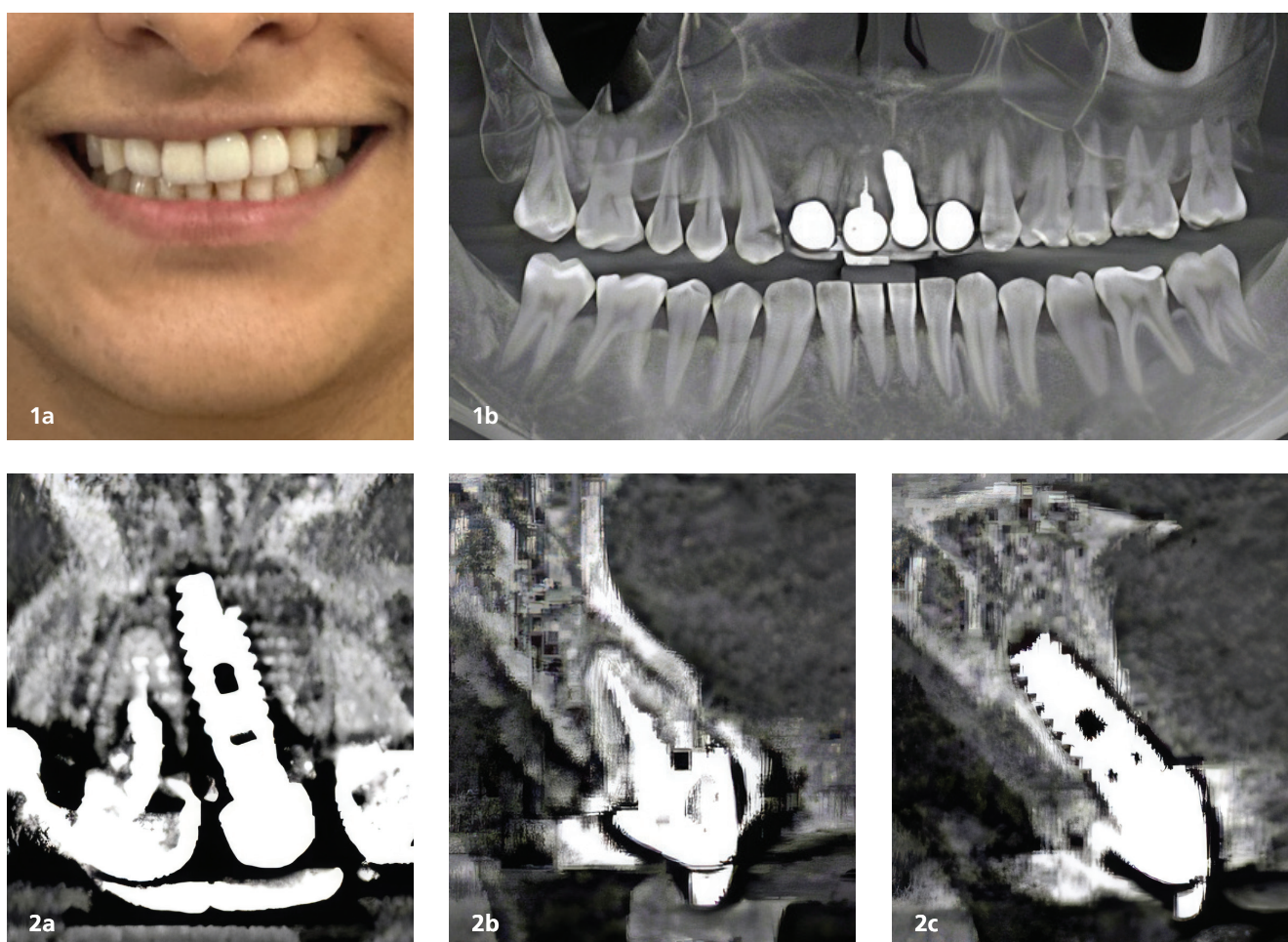
After conducting her own research into biological dentistry, she requested a comprehensive metal-free rehabilitation. Her primary request was removal of the existing titanium implant, extraction of the root canal-treated tooth, and replacement with ceramic implants and zirconia restorations.

Clinical examination revealed the following findings (Figs. 1a+b and Figs. 2a–c):

- A failing titanium implant at site #21
- A root canal-treated tooth #11 with a poor long-term prognosis
- Existing anterior restorations on teeth #12 and #22 requiring replacement
- Mandibular anterior spacing compromising functional anterior guidance and occlusion

Treatment planning

A staged treatment protocol was planned. The first phase involved orthodontic correction using clear aligners (Invisalign®) to close the lower anterior spacing and establish a stable functional occlusion with ideal overjet and overbite. Achieving an optimal occlusal relationship before definitive implant rehabilita-



Figs. 1a+b: Preoperative (a) clinical photograph and (b) orthopantomogram (OPG). – **Figs. 2a–c:** Preoperative three-dimensional cone-beam computed tomography (CBCT) evaluation of sites #11 and #21.

tion was considered essential for long-term functional stability (Figs. 3a+b).

Following completion of orthodontic treatment, biological surgical rehabilitation was undertaken.

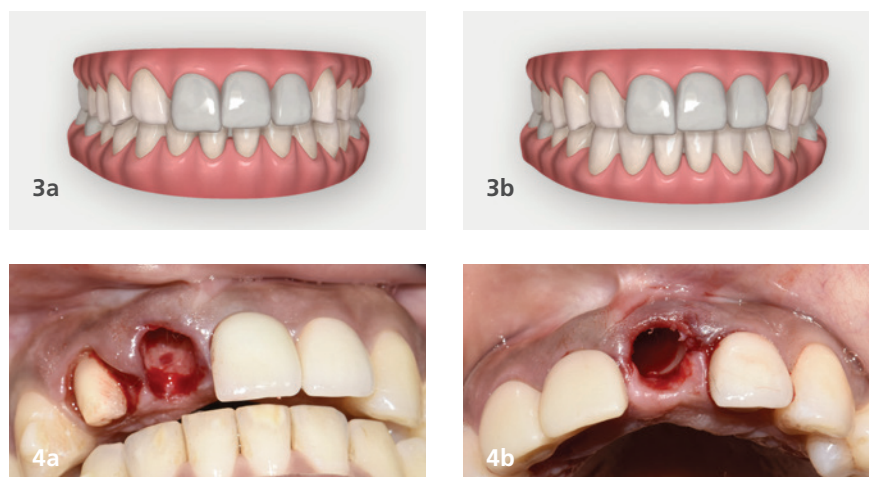
Surgical phase

In the first phase, the root canal-treated tooth #11 was atraumatically extracted under local anaesthesia (Figs. 4a+b), and an immediate monobloc zirconia implant was placed in the extraction socket with adequate primary stability. Healing progressed uneventfully.

After approximately six weeks, the existing titanium implant at tooth #21 was removed under local anaesthesia using a trephine bur with careful preservation of the surrounding alveolar bone. Manual debridement was done followed by dis-

infection with Ozone DTA using plasma probes. Another monobloc zirconia implant was immediately placed into the prepared site, achieving satisfactory primary

stability. No bone grafting procedures were required, and healing was allowed to proceed under a minimally invasive protocol (Figs. 5+6).



Figs. 3a+b: Pre- and postorthodontic treatment planning using iTero Lumina software. – **Figs. 4a+b:** Staged extraction of tooth #11 and removal of the implant at site #21.

After approximately six weeks, the existing titanium implant at site #21 was removed under local anesthesia using a trephine bur, with careful preservation of the surrounding alveolar bone. The site was manually debrided and disinfected using Ozone DTA with plasma probes. A monobloc zirconia implant was then immediately placed into the prepared site, achieving excellent primary stability. No bone grafting was required, and healing proceeded according to a minimally invasive protocol (Figs. 5+6).



Fig. 5: Removal of the titanium implant using a trephine drill. – **Fig. 6:** Meridian® implants planned for sites #11 and #21.

Implant system and dimensions

Meridian® 1.6 S Line (Steinsohn, Poland)

- Site #11: 4 × 11 mm
- Site #21: 4 × 11 mm

Excellent primary stability was achieved. Primary wound closure was achieved with minimal tension, and postoperative healing was uneventful.

Prosthetic rehabilitation

Following an uneventful healing period of approximately four months, implant stability and soft-tissue maturation were confirmed.

At the site of tooth #21, following removal of the titanium implant, mild loss of the crestal bone and a corresponding reduction in the gingival height were observed. The resulting soft-tissue deficiency led to a slight compromise in the gingival architecture compared with the contralateral side.

The patient was thoroughly informed about the available treatment options, including soft-tissue augmentation (connective tissue grafting) and hard-tissue augmentation to improve the peri-implant tissue contours. However, she declined all grafting procedures, preferring to avoid additional surgical interventions (Figs. 7a+b).

Consequently, the definitive prosthetic restoration was designed to harmonise with the existing soft-tissue contours and the patient's smile line. The zirconia crown was fabricated with careful consideration of the available gingival architecture, achieving a natural aesthetic outcome while respecting the patient's treatment preferences. The mild gingival discrepancy remained clinically acceptable and was not perceptible during normal smiling due to the patient's smile line. The patient expressed complete satisfaction with the final aesthetic and functional result.

Digital intra-oral scanning was performed, and definitive prosthetic rehabilitation was planned.

Four zirconia crowns (Fx, Amman Girschbach) were fabricated to restore teeth #11, #12, #21, and #22, creating a completely metal-free anterior rehabilitation.

Special attention was given to:

- Emergence profile
- Soft-tissue architecture
- Shade matching
- Incisal translucency
- Functional anterior guidance
- Stable occlusal contacts

Final occlusal adjustments were performed to establish mutually protected occlusion. Following the crown placement, occlusion was checked performing IOS scan occlusal gram obtained on iTero lumina as shown below (Figs. 8+9).

Clinical outcome

Clinical healing was uneventful throughout the follow-up period. At the five-month review, both ceramic implants demonstrated excellent peri-implant tissue health, with healthy, stable soft tissues and no bleeding on probing. Radiographic evaluation confirmed satisfactory osseointegration with stable crestal bone levels around both implants and no evidence of peri-implant pathology. Functionally, the patient reported excellent comfort during mastication and normal oral function without any complications. She also expressed complete satisfaction with the aesthetic outcome, noting that the definitive restorations blended naturally with the adjacent dentition in terms of contour, shade, and soft-tissue integration (Figs. 10+11).

Patient-reported outcomes

Five months following completion of treatment, the patient reported sustained improvement in numerous symptoms that had previously persisted for approximately five years. Foods that had consistently produced severe bloating and gastrointestinal discomfort were successfully reintroduced without recurrence of symptoms. Constipation, hard stools, recurrent anal fissures and incomplete bowel evacuation resolved completely. Migraine frequency and severity were estimated by the patient to have decreased by approximately 80–90%, accompanied by marked reduction in chronic cervical and rhomboid muscle tension.

The patient further reported near-complete resolution of heat intolerance and night sweats, almost complete disappearance of chronic periorbital eczema and itching, and significant improvement in sleep quality. Heavy menstrual bleeding, which the patient described as a life-



Figs. 7a+b: Implant placement in phase 1 at site #11 and phase 2 at site #21. –

Fig. 8: Final zirconia restorations on teeth #12, #11, #21, and #22.

long pattern, normalised following completion of treatment. Serial laboratory investigations demonstrated normalisation of the previously elevated white blood cell count. The patient additionally reported that a persistent nighttime sensation of feeling “wired” resolved following removal of the titanium implant.

These findings represent patient-reported outcomes documented with informed consent and are presented as temporal observations.

Discussion

This case illustrates the successful rehabilitation of a biologically conscious patient using a comprehensive metal-free treatment approach.

The staged protocol emphasised functional occlusal correction before implant placement, minimally invasive surgical techniques, ozone DTA, and definitive rehabilitation with bioactive ceramic implants and zirconia restorations.

Beyond the predictable clinical outcomes achieved in terms of aesthetics, function, and peri-implant tissue health, this case highlights the value of documenting patient-reported outcomes.

While conventional implant success is typically assessed using clinical and radiographic criteria, patient-centred measures including comfort, quality of life, and perceived systemic well-being may provide additional insight into treatment outcomes.

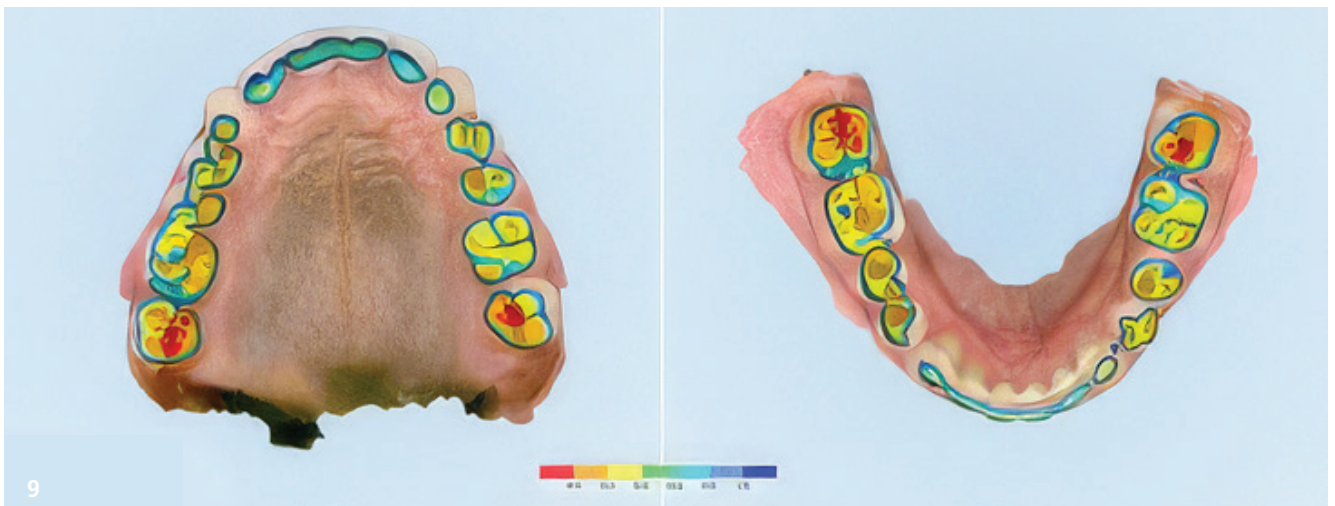


Fig. 9: Evaluation of occlusal forces using an iTero occlusogram.



Fig. 10: Digital workflow: intra-oral scan obtained at the five-month follow-up. – **Fig. 11:** Final smile at the five-month follow-up.

Clinical highlights

- Biologically oriented dental treatment approach
- Complete metal-free oral rehabilitation
- Removal of the failing titanium implant
- Extraction of the root canal-treated tooth
- Placement of two bioactive glass-ceramic implants (Meridian®, Steinsohn)
- Ozone-assisted decontamination and healing
- Placement of four definitive zirconia crowns
- Functional occlusal rehabilitation
- Excellent aesthetic integration
- Favourable patient-reported outcomes



Future prospective clinical studies involving standardised patient-reported outcome measures and immunological assessments are required to further investigate potential relationships between metal-free rehabilitation and systemic health in susceptible individuals.

Conclusion

Comprehensive biological rehabilitation using bioactive glass ceramic implants and metal-free zirconia restorations provided excellent aesthetic, functional, and biological outcomes in this patient.

The staged treatment protocol, including orthodontic correction, atraumatic surgery, ozone assisted healing, ceramic implant placement, and definitive zirconia restorations, resulted in predictable clinical success and high patient satisfaction.

In addition to the favourable clinical findings, the patient reported a marked improvement in overall well-being following treatment. Although these observations cannot establish causality, they underscore the importance of documenting patient-reported outcomes and encourage further research into comprehensive metal-free rehabilitation in appropriately selected patients.

About the author



References



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