Enhanced Periodontal Response and Esthetics of Implant-Supported Bridge by the Use of Galvanforming Technique: Case Report

Christina Tietmann, Dr med dent;* Frank Bröseler, Dr med dent, ZT*

ABSTRACT

Background: Galvanforming restorations have been placed over the past 15 years successfully. They offer several advantages over alloy restorations, including enhanced response to the periodontal tissues, biocompatibility, and superior esthetics.

Purpose: The purpose of this report is to show the use of the galvanforming process in dental implant restorations to transfer the benefits of this technique.

Materials and Methods: Two standard Bränemark fixtures were placed submerged in the lower mandible for the restoration of a three-unit bridge. The impression was taken at fixture level, and two cast individual telescope abutments were inserted. The galvanforming restoration was seated conventionally without any screw retention.

Results: An implant-supported galvanforming bridge is functioning successfully. The use of biocompatible materials does not compromise the stability of the restoration; instead, the effect on the periodontal tissues is excellent, resulting in less plaque accumulation and bleeding on probing. Microgaps were avoided by conventional seating on the individual telescope gold abutments, revealing superior occlusal esthetics.

Conclusions: This case report demonstrates the practicability of the biocompatible galvanforming procedure for implant-supported restorations enhancing periodontal response and esthetics.

KEY WORDS: biocompatibility, galvanforming procedure, implant-supported restoration, individual telescope abutment, periodontal health

Galvanforming procedures for dental restorations were first described by Rogers and Armstrong in 1961. The restorations, galvanforming crowns and bridges, offer several evident advantages over conventional metal ceramic restorations with alloy cast frames. In a comparative study, Wirz and Jäger demonstrated the superiority of galvanforming crowns over alloy or full-ceramic restorations owing to better esthetics, biocompatibility, precision of the crown margins, and less preparation of dental hard tissue. Erpenstein and colleagues showed long-term success with 96.4% of the restorations in place 6 years after seating, and Krieg found similar success rates in his longitudinal study on 498 single crowns.

Excellent quality of marginal fit of galvanforming restorations has been reported by several authors. Setz and colleagues described a medium marginal gap of less than 20 μm; 62% of the examined sites (n = 1057) showed nonmeasurable microgaps. Hämmeler and co-workers and Holmes and colleagues described similar findings.

As a major result of the perfect marginal fit and oxidation-free pure gold margins, superior esthetic results have been demonstrated in multiple studies. In a long-term study, Krieg showed the effect on esthetics attributable to biocompatibility resulting in periodontal health. Periodontal health, as evidenced by the Löe-Silness Gingival Index of 0, was seen in 82% of galvanforming crowns. Only 44.4% of the alloy-ceramic crowns demonstrated periodontal health.

Few cases of galvanforming restorations in combination with implants have been reported. Some reports have described galvanforming bridges on individual
titanium telescope abutments.\textsuperscript{11–14} van Iperen is known to have reported a galvanforming restoration based on a full-arch screw-retained frame.\textsuperscript{15} Completely individual gold telescope abutments in combination with galvanforming bridges have not been reported to date.

**MATERIALS AND METHODS**

**Processing of Galvanoceramic Crowns and Bridges**

Galvanoceramic crowns have been reported in the literature for over 15 years. Clinical relevance has been demonstrated by three main standardized processes. The AGC\textsuperscript{\textregistered} process is used for crowns, bridges, and implant-supported restorations as well as for dental-supported telescope partial dentures.\textsuperscript{16}

Instead of casting, the metal frame is formed from a gold-sulfite solution, using the electrochemical process. The duplicated master replica of the prepared tooth or abutment is covered by a thin silver layer that attracts the gold electrons to the anode of the galvanic bath, because of the copper wire connecting the duplicated plaster replica to the cathode.\textsuperscript{17}

The processed gold frame (Au 99.9\%) is consistent. Its thickness is about 0.2 mm without any inhomogeneous zones.\textsuperscript{16} The pure gold frame avoids any oxidation of porcelain-fusing metal alloys during the ceramic sintering process, resulting in a warm golden color as well as in the lack of ionic migration into the gingival margins.

Galvanocasting bridges are made by sintering galvanocasting crowns together with a casted frame by Keradec\textsuperscript{\textregistered} (Wieland Edelmeralle, Pforzheim, Germany).\textsuperscript{18}

**CASE STUDY**

A 64-year-old female patient presented with advanced caries of the lower left first bicuspid and third left molar, supporting a bridge. Endodontic treatment failed, because of obliteration and root fracture (Figure 1); these teeth had to be removed, resulting in an edentulous posterior ridge. The patient desired fixed restorations. The clinical and radiologic diagnosis revealed sufficient bone height. Two Bränemark MK II machined titanium implants (Nobel Biocare, AB, Gothenburg, Sweden) were placed in a two-stage surgical approach (first bicuspid 4 × 11.5 mm, regular platform; first molar 5 × 10 mm, wide platform) with an autogenous bone graft on the buccal aspect of the mesial fixture. Seven months later (Figure 2), healing abutments were placed in combination with an apically positioned split flap, owing to the lack of keratinized gingiva, sutured with 6–0 polypropylene microsurgical sutures (Figure 3). Two months later, the impression at fixture level for the final galvanocasting restoration of the implant-supported bridge was taken, as well as that for a galvanoceramic crown of the adjacent canine, after removal of an insufficient metal ceramic crown. Two individual gold abutments with a 7-degree angle and a galvanocasting bridge were fabricated and tried in with a reference.
splint (Figure 4). The final galvanofoming ceramic restoration was seated with glass-ionomer cement after coverage of the abutment screws with gutta-percha (Figures 5 and 6).

**DISCUSSION**

The objective of this study was to avoid microgaps of screw-retained implant-supported bridges by inserting a cemented bridge on individually fabricated abutments and to eliminate the disadvantages of porcelain fusing alloy.

After 7 months of seating, an excellent gingival response was apparent. Biocompatible materials (24-k gold and ceramics) ensured less plaque accumulation, resulting in less gingival inflammation and lower risk of peri-implantitis as shown by Tietmann and Brösel and Simonis and colleagues.10,19

Oxidation and ionic migration of base metal alloys into the dentogingival complex are avoided. The warm tone of the crown margins of the 24-k gold reinforced bridge results in excellent marginal esthetics. However, owing to the lack of keratinized gingiva, the buccal aspect of the mesial implant developed a 1-mm recession 7 months after seating. The periodontal response was similar to that of the adjacent canine, which was restored with a galvanofoming single crown.

Conventional cement seating on the individually fabricated gold abutments made occlusal screw retention unnecessary, enhancing the esthetics of the occlusal surface (Figures 7 and 8). The galvanofoming bridge was seated conventionally,10,21 occlusal screw retentions and, therefore, microgaps of the crown margins were avoided, resulting in less plaque accumulation.
It was possible to seat a fixed restoration for the patient's comfort. To date, the bridge is functioning well and the patient does not have any limitations to loading. Primary stability of the fixtures is not compromised.

CONCLUSIONS

This case report demonstrates the practicability of the galvanoforming procedure for implant-supported restorations, enhancing periodontal response and esthetics.

ACKNOWLEDGMENTS

The authors thank laboratory technician Mrs. Regina Haurand who was mainly engaged in the solution of this innovative restorative case.

REFERENCES