Nonsurgical management of soft tissue deficiencies for anterior single implant-supported restorations: A clinical report

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Periodontal surgical procedures may not always offer a predictable level of success in the reproduction of a natural gingival architecture. Two different nonsurgical approaches are described for the management of soft tissue deficiencies in anterior implant-supported restorations. Clinically acceptable esthetic outcomes of anterior implant restorations can be achieved by using zirconium custom abutments and gingiva-colored dental porcelain. (J Prosthet Dent 2007;97:1-5.)

The preservation or reproduction of a natural mucogingival architecture surrounding dental implants placed in the anterior maxilla is esthetically challenging for the restorative dentist, particularly when patients present with a high lip line when smiling. The challenge arises from the loss of mucogingival tissue as a result of bone loss after extraction of traumatically injured or periodontally compromised teeth, or is due to a traumatic surgical extraction or congenital defects. While surgical reconstructive procedures have been used for the improvement of hard and soft tissue defects prior to implant placement, the preservation of appropriate soft tissue architecture around implants remains challenging. A retrospective study by Choquet et al[1] showed that when the distance from the contact point to the bony crest was greater than 5 mm due to bone loss, the maintenance of interproximal papilla may not be predictable.

Various prosthodontic techniques reported to improve the soft tissue deficiency include the use of a gingiva-colored acrylic resin facade,[2,3] a flexible silicone-based tissue-colored material,[4] or removable prostheses such as the Andrews Bridge System (Institute of Cosmetic Dentistry, Amite, La).[5,6] The loss of peri-implant tissue can also be corrected by applying gingiva-colored porcelain on the cervical portion of implant-supported metal-ceramic restorations.[7-15] However, when implants are incorrectly angled or improperly positioned with soft tissue defects, the challenge of creating harmonious mucogingival contours may be facilitated by the application of gingiva-colored porcelain onto the cervical collars of metal or ceramic implant customized abutments.[16] This clinical report illustrates 2 different methods of using gingiva-colored porcelain to manage soft tissue deficiencies for anterior single implant-supported restorations.

CLINICAL REPORT

Patient 1: Customized zirconium abutment and an all-ceramic crown modified with gingiva-colored porcelain

A 37-year-old white woman presented with an implant-supported provisional restoration on the maxillary left lateral incisor. Clinical and radiographic examination revealed the presence of a titanium dental implant (Branemark System; Nobel Biocare, Yorba Linda, Calif) and a prefabricated titanium abutment (Cera One; Nobel Biocare) retaining an acrylic resin provisional fixed restoration. One of the patient's chief complaints was the uneven level of the gingiva of the maxillary anterior teeth (Fig. 1). The patient's dental history indicated that periodontal surgery was attempted twice to regenerate the peri-implant soft tissue. Therefore, nonsurgical management of the soft tissue around the implant, which incorporated the use of a customized ceramic abutment and an all-ceramic definitive restoration modified with gingiva-colored porcelain applied to the cervical portion, was proposed to the patient.

An acrylic resin (TempArt; Sultan Chemists Inc, Englewood, NJ) fixed provisional restoration was placed on an interim abutment (Nobel Biocare), which was modified using light-polymerizing composite (Z100; 3M ESPE, St. Paul, Minn) chairside to enhance the peri-implant soft tissue contour.[17] An implant-level impression was made using an impression coping (Nobel Biocare) and a polyether impression material (Impregum; 3M ESPE).

A definitive zirconium abutment and coping for an all-ceramic crown were fabricated using computer-aided design/computer-assisted manufacturing (CAD/CAM) technology (Procera; Nobel Biocare). The

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Fig. 1. Intraoral view of dental implant to be restored in area of maxillary left lateral incisor.

Fig. 2. Zirconium custom abutment and all-ceramic restoration modified with gingiva-colored porcelain.

Fig. 3. Intraoral evaluation of definitive abutment and restoration.

Fig. 4. Intraoral view of completed implant-supported restoration.

recontoured interim abutment was removed from the mouth, sterilized, and scanned using a contact scanner and computer software (Procera Piccolo; Nobel Biocare). The recorded data were then transferred to a production facility via the Internet for the manufacturing of a definitive zirconium abutment and coping through a computerized milling process (Procera Zirconia; Nobel Biocare).

The zirconium abutment and coping for the definitive restoration were evaluated intraorally to confirm the peri-implant soft tissue contour before tooth and gingiva-colored veneering porcelain (Noritake Super Porcelain; Noritake, Nagoya, Japan) were applied onto the coping (Fig. 2). The definitive restoration was then evaluated intraorally, and periapical radiographs were made to verify the fit of the abutment and the restoration. The abutment screw (TorqTite; Nobel Biocare) was torqued to 32 N·cm with a torque wrench (Nobel Biocare), and the screw-access channel was obturated using a light-polymerizing provisional resin (Fermit; Ivoclar Vivadent, Schaan, Liechtenstein). The definitive restoration was then luted using a resin-modified glass ionomer cement (FujiCEM; GC America, Alsip, Ill) (Fig. 3).

The patient was monitored at 2-week intervals for 2 months after being given oral hygiene instructions, and once every 6 months afterward. The last follow-up of the patient was 1 year following the insertion of the crown. The patient was functioning well, and no signs of complication associated with the new crown were observed (Fig. 4).

Patient 2: Customized zirconium abutment modified with gingiva-colored porcelain and an all-ceramic crown

A 59-year-old white man presented with an interim acrylic resin removable partial denture for the missing maxillary left lateral incisor. Clinical and radiographic examinations showed the presence of an osseointegrated titanium dental implant (Branemark; Nobel Biocare) to be restored (Fig. 5). The patient's dental history revealed previous unsuccessful implant placements at this site, resulting in a mucogingival tissue defect.

Fig. 5. Intraoral view of dental implant to be restored in area of maxillary left lateral incisor.

Fig. 7. Intraoral view of completed definitive abutment and crown.

Due to the patient's desire to avoid further surgical procedures, a treatment plan was made to restore the missing left lateral incisor and surrounding tissues with a custom ceramic abutment modified with gingiva-colored porcelain and an all-ceramic definitive restoration. A porcelain veneer, with no tooth preparation, was planned for the maxillary left canine to improve the definitive esthetic outcome.

Six weeks following the placement of a provisional restoration using a modified interim abutment (Nobel Biocare) and a cementable provisional crown,[17] an impression was made using a polyether impression material (Impregum; 3M ESPE). An acrylic resin (Pattern Resin; GC America) pattern for the definitive abutment was fabricated on the definitive cast, and the pattern was scanned using a contact scanner and computer software (Procera Piccolo; Nobel Biocare). A definitive zirconium custom abutment and coping for the all-ceramic restoration were fabricated using the same process described previously. Gingiva-colored porcelain (Creation ZF-DR; Klema Dentalprodukte, Meiningen, Austria) was added onto the cervical and interproximal areas

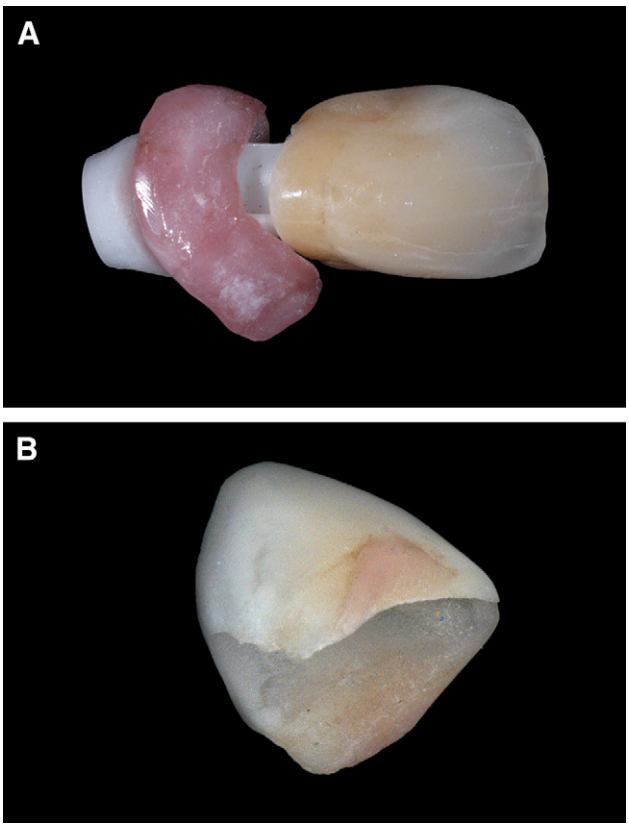

Fig. 6. A, Zirconium custom abutment modified with gingiva-colored porcelain and all-ceramic restoration. **B,** Porcelain veneer for maxillary canine.

of the zirconium custom abutment to reproduce missing peri-implant soft tissue and interproximal papillae, resulting in a ridge lap design of the custom abutment. The definitive all-ceramic restoration was fabricated on the milled ceramic coping (Fig. 6, *A*). The porcelain veneer was also fabricated for the maxillary left canine with tooth-colored porcelain (Creation CC; Klema Dentalprodukte) and gingiva-colored porcelain for the cervical portion (Creation ZF-DR, Klema Dentalprodukte) (Fig. 6, *B*).

The restoration was evaluated intraorally, and the abutment screw (TorqTite; Nobel Biocare) was torqued to 32 N·cm with a torque wrench (Nobel Biocare). After the screw-access channel was obturated using a light-polymerizing provisional resin (Fermit; Ivoclar Vivadent), the definitive all-ceramic crown and porcelain veneer were then luted using a resin cement (Variolink II; Ivoclar Vivadent) (Fig. 7).

The patient was monitored for 2 months after being given oral hygiene instructions, and once every 6 months afterward. The last follow-up of the patient was 1 year following the insertion of the crown. The patient was functioning well, and no signs of complication associated with the new crown and peri-implant soft tissue were observed (Fig. 8).

Fig. 8. Intraoral view of completed implant-supported crown.

DISCUSSION

Two different methods of using gingiva-colored porcelain were illustrated for the management of tissue deficiencies for single implant-supported restorations. While applying gingiva-colored porcelain onto the cervical portion of definitive crowns appears more common, modification of custom abutments with gingiva-colored porcelain may be indicated, particularly when adjacent tooth forms are more tapered and interproximal gingival embrasure spaces are large. When gingiva-colored porcelain is applied on the crown, the cervical extension of porcelain toward gingival embrasure spaces may be limited by the path of insertion of the crown and adjacent teeth. However, the application of gingiva-colored porcelain on customized abutments allows gingival embrasure spaces to be filled where interproximal papillae are missing, and allows for the creation of a natural appearance with fewer limitations from the contours of the adjacent teeth.

This technique may also be used in situations where future possible recession of the peri-implant tissues is anticipated, which may result in exposure of the implant-abutment interface. A custom abutment modified with gingiva-colored porcelain can prolong the esthetic life of the restoration. Another benefit of this technique is the relocation of the cement interface between the abutment and the restoration away from the tissues. The cement remnants on intracrevicular restorative margins may be difficult to remove completely and can trigger an unfavorable biologic effect on peri-implant tissue.[18] Single implant restorations with wider gaps at restorative margins have been reported to exhibit more marginal bone loss around implants.[19]

The supragingival relocation of the crown margin, however, may result in a visible cement line at the crown-abutment interface and also make it more technically challenging to fabricate the custom abutment and the definitive restoration. Furthermore, it is necessary to provide proper oral hygiene instruction and monitor the health of peri-implant tissue, as the ridge lap design of the custom abutment may reduce accessibility for cleaning.

SUMMARY

Two different prosthetic approaches to manage soft tissue deficiencies for single implant-supported restorations were presented. Through the use of gingiva-colored porcelain on the cervical portions of zirconium custom abutments or all-ceramic restorations, predictable esthetic results can be achieved. Comprehensive esthetic analysis of hard and soft tissues and proper treatment planning may be required to obtain an appropriate clinical outcome.

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