

DENTAL TECHNIQUE

A digital approach for 1-step formation of the supraimplant emergence profile at the time of immediate implant placement



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The emergence profile plays a key role in the esthetics of implant-supported restorations.^{1,2} It is determined by the correct 3-dimensional (3D) position of the implant and maintenance of a labial bone wall with sufficient height and thickness.³⁻⁵ In the apicocoronal direction, the implant should be inserted 3 to 4 mm apical to the gingival margin of the future restoration.^{6,7} Optimal implant placement can be reliably achieved with the aid of a surgical guide.⁸ Optimal emergence profile should provide ideal peri-implant tissue around the restoration, consistent with the cervical contours of the natural contralateral tooth. However, achieving a harmonious gingival architecture around dental implants remains a major challenge in the esthetic region.

Two methods have been described for shaping the peri-implant soft tissue. One is placing a modified interim restoration, and the other is fabricating a pontic with a convex shape in a fixed partial denture.^{9,10} However, the interim restoration has to be excessively contoured to shape the emergence profile, and this will lead to gingival inflammation.¹¹⁻¹⁴ Hence, mimicking biologic width around the implant similar to that of the natural tooth has

ABSTRACT

An optimal soft tissue profile is essential for obtaining optimal esthetics in anterior implant-supported restorations. Commercially available cylindrical healing abutments do not mimic the shape of natural teeth and may create a poor peri-implant emergence. This article introduces a digital protocol to improve the formation of the supraimplant emergence profile with an individualized healing abutment fabricated by computer-aided design and computer-aided manufacture (CAD-CAM) at the time of implant placement. A benefit of this technique is obtaining optimal morphology of the peri-implant soft tissues, especially for teeth with increased horizontal overlap. (*J Prosthet Dent* 2019;122:104-7)

become the goal for a biomimetic approach in implant dentistry.¹⁵ According to the formula proposed by Goldstein et al,¹⁶ the optimal size of the perimeter of an individualized healing abutment should be reduced by 10%, minimizing the risk of the labial gingival margin recession.

A modified digital workflow allows the fabrication of an individualized healing abutment in accordance with the cervical profile of the contralateral teeth. The design of an individualized healing abutment and its use in the esthetic region to achieve excellent esthetics is described in this technique for an individualized healing abutment.

TECHNIQUE

1. With computer-aided design and computer-aided manufacture (CAD-CAM) software (Dental Manager; 3Shape), mirror the profile of the contralateral

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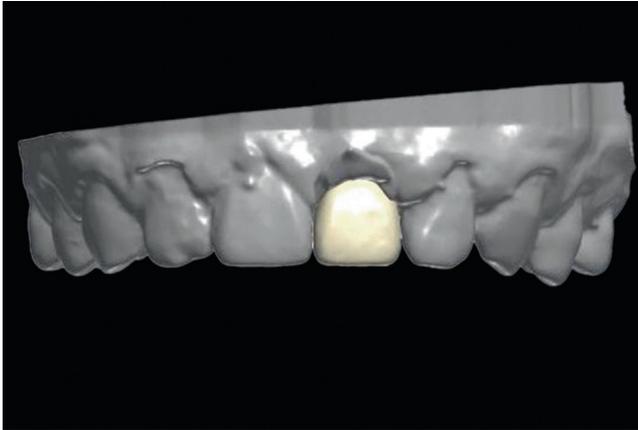


Figure 1. Cervical profile digitally mirrored from contralateral tooth.

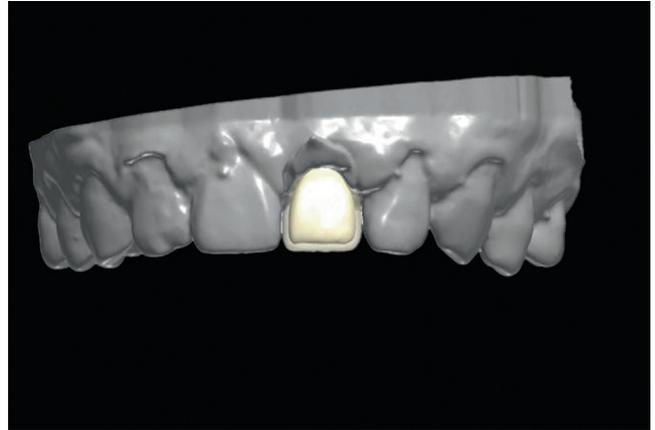


Figure 2. Cervical profile of contralateral tooth reduced by 10% in perimeter and used as template for emergence profile of individualized healing abutment.

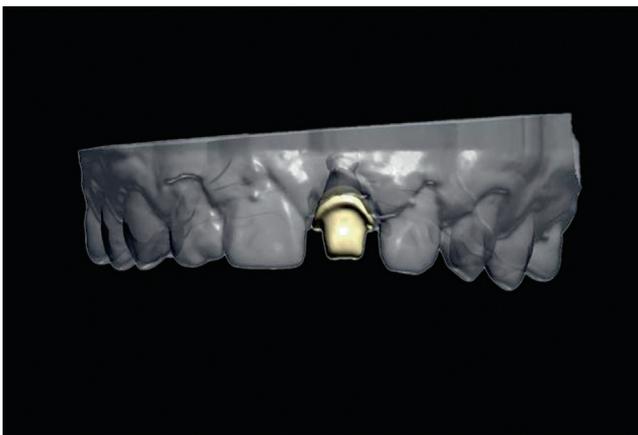


Figure 3. Abutment placed 1 mm above marginal gingiva to prevent recession of labial gingival margin.



Figure 4. Individualized healing abutment fabricated through CAD-CAM. Prefabricated interim abutment prepared and bonded to individualized PMMA abutment with resin cement. Abutment locator made with reference to adjacent teeth. CAD-CAM, computer-aided design and computer-aided manufacture; PMMA, polymethyl methacrylate.

tooth in the edentulous region (Fig. 1). Subtract the crown part and leave the cervical part.

2. Reduce the cervical perimeter by 10% according to the data reported by Goldstein et al¹⁶ (Fig. 2). Design an abutment with a cervical profile mimicking but slightly smaller than the contralateral tooth.
3. Place the platform of an individualized healing abutment 1 mm incisal to the marginal gingiva of the adjacent teeth (Fig. 3). Create definitive CAD models of the individualized healing abutment with software (Dental Manager; 3Shape).
4. Fabricate with polymethyl methacrylate (PMMA; HUGE) restoration material using CAD-CAM. Bond to a prefabricated interim abutment (ANKYLOS C/X; Dentsply Sirona) with a resin cement (SAC; Kuraray) (Fig. 4). Remove excess resin to create a smooth contour.

5. In the laboratory, fabricate the individualized healing abutment locator (Pattern Resin; GC) with reference to the adjacent teeth.
6. Sterilize the individualized healing abutment before connecting it to the implants. Use an ethylene oxide sterilizer (Steri-Vac; 3M) at 54 °C with 2-hour exposure to ethylene oxide, followed by overnight aeration at 55 °C for 12 to 14 hours.
7. Position the CAD-CAM surgical template as designed in the software and evaluate its position through the windows fabricated on the template.
8. Place a 3.5×11-mm platform switched implant (ANKYLOS C/X; Dentsply Sirona) guided by the CAD-CAM surgical template from the beginning to the end of the implant placement procedure. If needed, use bone filler and collagen membrane (Bio-Oss; Geistlich) to supplement the bone around the implant.



Figure 5. Nonrestorable maxillary left central incisor. Patient met indications for immediate implant surgery as labial bone plate was intact. After minimally invasive removal of residual root, immediate implantation was performed, and individualized healing abutment was placed.



Figure 6. Using individualized healing abutment resulted in ideal outcome where soft tissue around implant-supported abutment appeared stable with no signs of inflammation or recession.

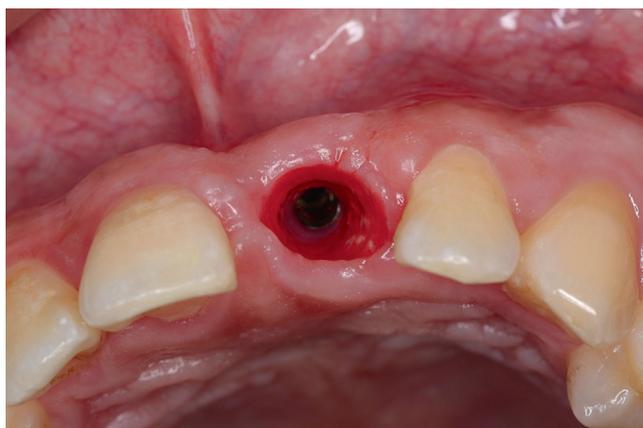


Figure 7. Healthy emergence profile in accordance with cervical profile of contralateral tooth acquired after 6 months. Evaluation of soft tissue revealed no discrepancies for mesial and distal papilla, symmetric curvature and level of facial mucosa, similar root convexity, and no abnormality of soft tissue color or texture compared with maxillary right central incisor.



Figure 8. Implant-supported crown replacing maxillary left central incisor with clinically pleasant and harmonious treatment outcome. Interdental papillae filled gingival embrasure, enhancing optimal esthetic result.

9. If primary stability is achieved (≥ 25 Ncm), place the individualized healing abutment (Fig. 5).
10. Fabricate an Essix appliance (Vacuum Forming Materials; Keystone) as the interim restoration with an acrylic resin tooth (Re-Fine Bright; Yamahachi Dental) during the period of osseointegration. The design of this restoration should protect the underlying soft tissue from being compressed by the denture, healing abutment, or crown fixed on the abutment during the healing phase.
11. Make an implant-level personalized impression (Silagum; DMG) or digital scan 6 months after implant placement (Figs. 6, 7). Design and fabricate the individualized definitive ceramic abutment and crown (Lava; 3M) in the laboratory.

12. Make a radiograph after delivery of the definitive restoration. Verify the restoration of the marginal adaptation and absence of areas of radiolucency around the implant.
13. Schedule follow-up appointments at definitive crown delivery, 6 months, and 12 months after loading (Fig. 8). During follow-up, evaluate the peri-implant soft tissue and marginal bone loss.

DISCUSSION

Commercially available cylindrical healing abutments cannot create an ideal peri-implant emergence profile, especially in the esthetic zone. Therefore, individualized healing abutments were placed to mimic the biological

shape of natural teeth. Digitally designed individualized healing abutments provide support and volume to the soft tissues, protecting the interproximal bone tissue and inhibiting further bacterial penetration to the bone-implant interface.¹⁷

SUMMARY

The individualized healing abutment design allows shaping of the morphology and optimization of esthetic outcomes during implant osseointegration. This digital design process may also minimize the number of surgical interventions and shorten treatment time.

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