The Creation of an Emergence Profile, Part I

Using an Interim Restoration as an Aid to Implant Positioning

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INTRODUCTION

The importance of the creation of an ideal emergence profile to enhance aesthetics in the high lip-line case in either conventional or implant-supported short-span fixed partial dentures (FPDs) cannot be overstated. The success of the case shown in Figures 1 to 3 is almost entirely due to the appearance created by the ovate pontic form of the 2 central incisors and the supporting implant abutment teeth, which appear to emerge "naturally" from the gingival tissues.

The limitations of the use of pink porcelain, as opposed to maximizing the use of natural tissues, are seen in the same case where the posterior segments required the addition of a pink material to disguise the advanced tissue loss in these areas (Figure 4).

Inevitably, there are situations in which the use of a pink material makes sense, grafting is not always appropriate, and some patients may prefer a simpler graft-free option. However, in the high lip-line case, aesthetics will be compromised by a visible junction between the gingiva and any pink material.

Background

The many difficulties associated with short-span implant-supported FPDs are well demonstrated in the case shown in Figure 5. The prosthesis provided is poor aesthetically for a number of reasons:

- The tooth form does not conform to the requirements of the "Golden Proportion."
- There has been no attempt to provide any form of emergence profile as can be seen from the gingival tissues on removal of the prosthesis (Figure 6).
- The implants appear to be too mesially placed—there has been little or no attempt to disguise this.
- The improvement in aesthetics of the final prosthesis shown in Figure 7 was achieved by the initial placement of a provisional screw-retained FPD fabricated in composite to help reposition the soft tissues. The creation of an emergence profile with ovate pontics (Figure 8) has addressed most of the problematic issues. Tooth form is more harmonious, and the papillae and tissue contour have enhanced the appearance. In addition, alteration of the emergence profile around the implants has apparently "repositioned" the lateral incisors distally and improved their apparent position.

Producing an ideal emergence profile with provisional restorations is critically important, but this is only really purposeful if the created emergence profile can be accurately reproduced and transferred to the working model in the laboratory. This is because the tissue form created is only stable as long as it is passively supported by the provisional restoration. Figures 9 and 10 show the surprisingly swift collapse and distortion of the soft tissues that occurs in minutes once

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Figure 1. The case on presentation with severe periodontal involvement and poor aesthetics.

Figure 2. The created emergence profile following implant placement and use of a provisional screw-retained composite partial denture.

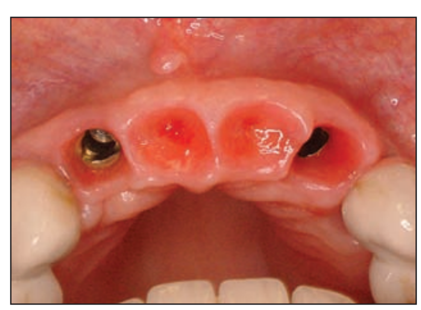

Figure 3. The final aesthetic result, following fit of the definitive fixed partial dentures (FPDs).

Figure 4. The aesthetic difficulties associated with pink porcelain.

Figure 5. Poorly designed definitive implant-supported FPD showing compromised aesthetics.

Figure 6. The edentulous ridge upon removal of the FPD and screw-retained abutments.

Figure 7. Redesigned cement-retained FPD.

Figure 8. The created emergence profile prior to FPD cementation.

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Figure 9. The emergence profile on removal of a screw-retained provisional composite FPD.

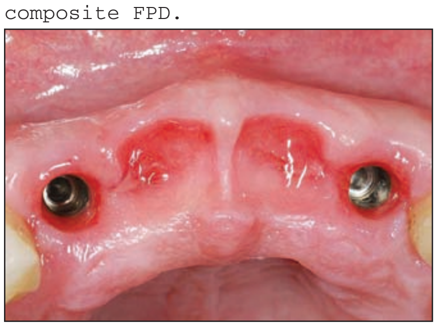

Figure 10. The collapsed emergence profile some 30 minutes following removal.

Figure 11. A typical edentulous ridge on presentation for implant placement.

the temporary restoration is removed. Reproduction of this distorted gingival shape in the final impression would negate the great deal of the time and effort spent on the creation of the emergence profile—a definitive restoration fabricated on such a model would be deficient in its support of the tissues and be subject to arbitrary, time-consuming additions to the porcelain in an attempt to restore the correct contours.

Objectives

Three concerns associated with short-span implant-supported FPDs in the aesthetic zone are implant positioning, the creation of an emergence profile to enhance aesthetics, and the reproduction of the created emergence profile in the final working models.

Solutions

The problem generally encountered by the implantologist is not only to place the implants within the best bone available, but also to judge exactly where the ideal position should be, commensurate with the aesthetic demands of the case. When the patient

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presents to the implantologist with an edentulous ridge as shown in Figure 11, the only aid to implant positioning may be the provisional restoration.

One answer to the problem may lie in the restorative phase of preimplant treatment; refining the aesthetics of a case with a well-designed provisional restoration will not only prepare the emergence profile prior to implant placement, but will also assist the surgeon in optimizing implant positioning.

Finally, a technique was developed which would accurately reproduce the created emergence profile in the impression phase of treatment.

CASE REPORT

Diagnosis and Treatment Planning

A patient presented with failing incisors is shown in Figure 12. Intraoral radiographs showed varying degrees of bone loss around the teeth, which exhibited grade 1 to 2 mobility.

In view of the poor prognosis of the incisor teeth, the high lip-line, and the patient's desire for improved aesthetics, a decision was made to remove the teeth. However, the patient was reluctant to undergo grafting procedures.

A decision was made to extract all 4 incisor teeth and, in the first instance, replace them with an immediately provided adhesive-retained FPD. The intention was to use this FPD to guide the soft tissues during the healing phase. The created profile would then in turn aid implant positioning, further

Figure 12. Preoperative photo of an aesthetically displeasing case.

Figure 13. The Maryland FPD at initial cementation.

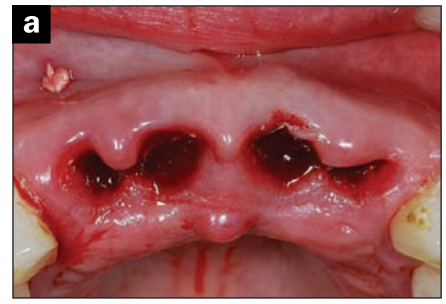

Figure 14a. The soft-tissue profile on extraction.

Figure 14b. The soft-tissue profile 4 weeks after extraction.

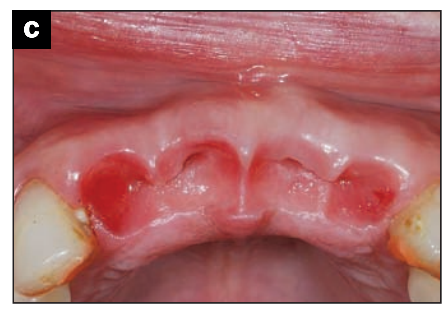

Figure 14c. The healing emergence profile developing at 7 weeks.

Figure 14d. The finalized emergence profile at 10 weeks.

promoting tissue maintenance with the final restoration.

Impressions and a face-bow recording were taken and the resultant study models mounted on a fully adjustable articulator. During trial wax-ups on duplicated study models, it became apparent that if the slightly over-erupted lower incisors were shortened by about 1.5 mm, the tooth position of the upper incisors could be retracted to give a more pleasing aesthetic result in the interim healing phase with the Maryland bridge and with the final definitive restoration. The patient was aware that the prognosis of the lower anterior teeth was guarded and gave permission for the relevant adjust-

Figure 15. Preoperative retracted anterior photo.

Figure 16. The clinical appearance after a 10-week healing period.

Figure 17. The created emergence profile upon removal of the provisional FPD.

ments to be made to them at the time of fitting the upper Maryland FPD.

Clinical Protocol

Impressions were taken with a polyether impression material (Impregum Penta-6 Minute Soft [3M ESPE]). Then, the working model was fabricated by silver plating to ensure maximum accuracy. The teeth scheduled for extraction were sectioned from the working model and the anticipated ridge shape post-extraction cut into the model to allow the technician to fabricate an ovate pontic form in the final Maryland FPD. The Maryland pattern was made in resin (Pi-Ku-Plast HP 36 [Bredent]), then invested and cast in a nonprecious metal alloy (Niadur DFS [Picodent LTDA]). The completed FPD framework was covered with composite (Gradia [GC America]).

The author prefers the use of a glass ionomer for cementation rather than composite. The use of this material allows straightforward removal of the FPD, minimizing the potential for damage to the tooth or distortion of the metal framework. The material used here was GC Fuji TRIAGE Pink (GC America). The pink color of this material allows for easy identification and removal of the

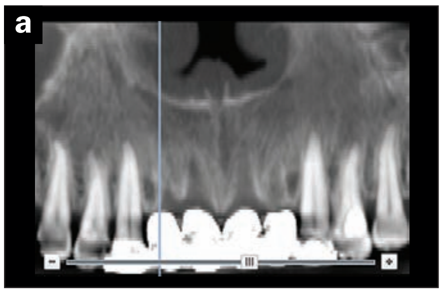

Figure 18a. The radiographic appearance with the Maryland FPD in place, prior implant placement.

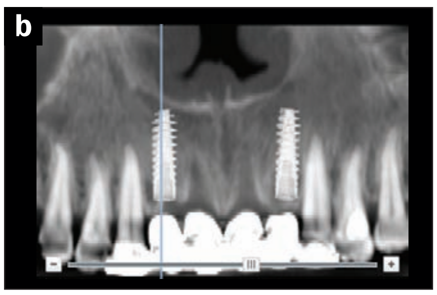

Figure 18b. The implant position, simulated in NobelClinician (Nobel Biocare) software.

Figure 19. The emergence profile prior to implant placement.

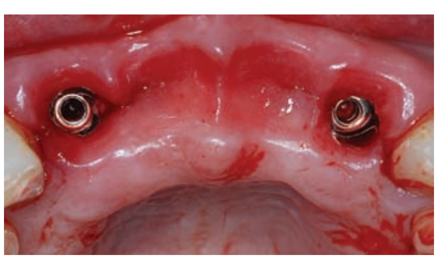

Figure 20. The clinical picture immediately following implant placement.

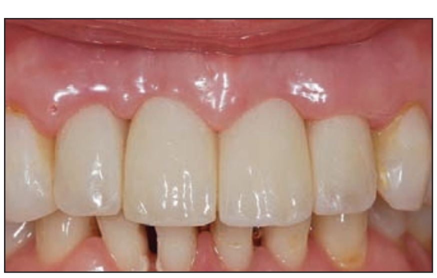

Figure 21. Clinical view; 4 days postimplant placement and provision of the immediate-loaded, screw-retained FPD.

cement with conventional instrumentation or by blasting with 50 µ aluminium oxide powder using a chairside air abrasion unit (EtchMaster Micro Air Abrasive Tip [Groman Dental]).

Following the administration of local anaesthetic, the 4 incisors were extracted with an atraumatic technique and the FPD immediately cemented as shown in Figure 13. Discreet metal spurs between the canine and premolar teeth on the framework help to locate the framework as it is cemented into place and aid in retention and stability.

It is not in within the scope of this article to describe in detail the clinical technique used to influence the healing tissues to form the final emergence profile, but essentially the Maryland FPD was removed at regular intervals and composite added to the fit surfaces of the pontics to guide tissue healing in the desired direction. The 10-week progress of the maturing tissues is shown in Figures 14a to 14c, with the final emergence profile achieved seen in Figure 14d. This profile now acts as a guide to implant placement; in this case in the lateral incisor pontic sites. The change in the clinical appearance achieved is seen in Figures 15 and 16.

Implant Placement

The emergence profile prior to implant placement is seen in Figure 17. When faced with an appearance such as this, it is immediately evident that the ideal position for each fixture will be at the base of the "depression" developed in the tissues by the bridge pontics. In this case, 2 implants are required, although the profile created gives 4 options for placement. At this stage, what is required is to cross reference the clinical picture with the radiographic evidence, to confirm that there is sufficient bone available in each site to allow the fixture to be optimally position.

Three-dimensional imaging with cone beam computed tomography (CBCT) in conjunction with the use of planning software hugely facilitates planning and helps to achieve a predictable aesthetic result. In this case, the patient was scanned using an Accuitomo F170 scanner (J. Morita USA), and a 6-cm program was selected for the exposure. The DICOM data was exported to NobelClinician planning software (Nobel Biocare). NobelClinician provides an intuitive framework for viewing CBCT data and for planning implant treatment.

Using the software, it was possible to visualize reformatted cross sections through the ridge in each prospective implant site. It was possible to clearly visualize each pontic site, and to position a virtual fixture in each of these sites, confirming that there was sufficient bone available for 13-mm active fixtures (Replace Select [Nobel Biocare]). The software offers various visualizations modes which allow the virtual fixtures to be viewed *in situ*, and the position in relation to the bone and the adjacent teeth to be modeled.

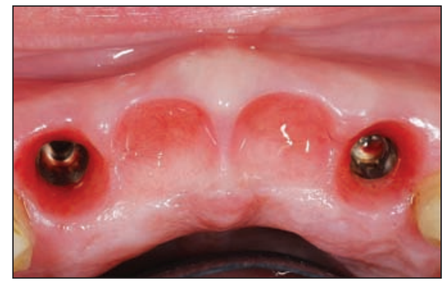

Figure 22. Clinical view upon removal of the immediate load FPD; 4 months after implant placement.

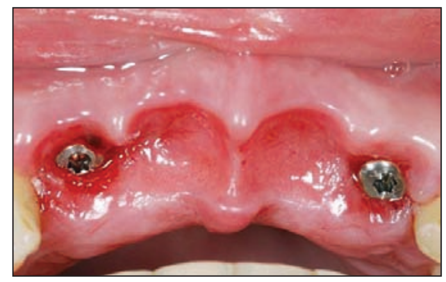

Figure 23. Clinical photo on the day of implant placement.

Although the software has the capacity to produce a surgical guide, in this case, it was felt that the FPD pontics visualized on screen and the created emergence profile gave a sufficiently distinct indication of exactly where the point of insertion for each fixture should be, and the cross-sectional imaging clearly indicated that there was sufficient bone in each site. The authors think of this as "pontic-guided surgery."

Implant surgery took place using a flapless approach. A 4-mm biopsy punch was used prior to site preparation. A 2.8/3.2-mm step drill was used to the full depth of the site, and then a 3.2/3.6-mm step drill was used to a depth of about 7 mm. This allowed for the development of a high insertion torque, a small amount of ridge expansion at the base of the site, and avoided excessive stress at the fixture head, which might have led to crack development.

The NobelActive fixtures were carefully placed using a hand insertion tool. The generally tapered form of the fixture, the aggressive thread design, and the clever reverse tap all contribute to a high, controlled level of primary stability (Figures 18a and 18b).

The clinical appearance of the soft tissues is seen prior to and immediately following implant placement (Figures 19 and 20). An impression of the implants was taken at the time of placement and sent to the dental laboratory team for the fabrication of the immediate-loaded screw-retained composite FPD to be fitted later the same day.

The completed fixed partial prosthesis was fabricated in composite (Gradia) with reinforcement fibers incorporated (everStick C&B fibre [Stick Tech Ltd]). The palatal positioning of the screw access cavities is ideal—facilitating the provision of a screw-retained design for both the provisional and definitive prostheses. The provisional restoration is shown at the review 4 days later (Figure 21).

The provisional immediate restoration was left in place for 4 months. The soft-tissue emergence profile resulting from further maturation is shown following removal of the provisional restoration in Figure 22 and when compared with the clinical picture on the day of implant placement (Figure 23). This created profile will now provide an excellent starting point for the definitive prosthesis.

The second article in this series will demonstrate the clinical impression technique evolved to duplicate this created emergence profile in the definitive working models.✦

Acknowledgement

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