A METHOD TO TRANSFER PLANNED IMPLANT LOCATIONS TO A PREORTHODONTIC CAST

Eddie Hsiang-Hua Lai, DDS, MSD,^a Yi-Jane Chen, DDS, MSD,^b Chung-Chen Jane Yao, DDS, PhD,^c and Jenny Zwei-Chieng Chang, DDS, MSD^d

School of Dentistry, College of Medicine, National Taiwan University, Taipei, Taiwan

A technique is presented to transfer the orthodontic implant position from the diagnostic tooth arrangement onto the original cast. Plastic cast bases combined with a customized position plate are used to fabricate duplicates of the original dental casts. The position plate is customized with a transparent ruled grid trimmed and attached on its upper surface to allow easy transfer of the proposed implant position from the diagnostic arrangement to the original cast. (J Prosthet Dent 2008;100:153-156)

Interdisciplinary treatment planning is mandatory for orthodontic treatment when the dental implants placed in the edentulous area are to be used initially as anchors for tooth movement and later as prosthetic abutments for the fixed restoration.¹⁻³ Three-dimensional planning of the dental implant location site is critical to avoid compromising subsequent orthodontic tooth movement, especially when the teeth are to be moved toward or away from the implant during orthodontic treatment and the exact location of the implant is uncertain.

Only a few reports have described the methods used to determine preorthodontic implant location and orientation.^{2,4,5} All suggest fabricating the pretreatment diagnostic waxing on the casts with tooth and base positions identical to the original dental casts. The position of the preorthodontic implants may be transferred to the original cast for fabrication of the surgical template, by measuring the distance from a point on the base of the diagnostic arrange-

ment to the implant with a caliper, and transferring the implant location using the same reference point on the base of the original cast.⁶

An alternative technique to fabricate identical duplicates of the original casts using plastic cast bases combined with a customized position plate is presented. Two sets of dental casts with identical tooth and base portions are fabricated. One set of casts may be used for diagnostic waxing; the other may serve initially as the record of existing tooth position and later for fabrication of a surgical template. The customized position plate grid allows ease of transfer of the proposed implant position from the diagnostic arrangement cast to the cast for surgical template fabrication.

TECHNIQUE

1. Fabricate 2 sets of maxillary and mandibular casts.
2. Mark the midline of the first maxillary cast with a pencil.
3. Place the occlusal surface of the maxillary cast on the inner, nonslip

surface of a position plate (T3062-00; Leone SpA, Firenze, Italy), with its midpalatal plane matching the midline on the position plate, and secure the cast in correct position against the hooks on the position plate with rubber bands (Fig. 1).

4. Place the rear guide rails into the dovetails of a maxillary plastic cast base (T3061-00; Leone SpA), and pour vacuum-spatulated dental plaster (Lab Plaster, Regular; Dentsply Trubyte, York, Pa) into the maxillary plastic cast base (Fig. 2).

5. Assemble the maxillary cast secured on the position plate with the guide rails and maxillary plastic cast base to form the base of the maxillary dental cast (Fig. 3).

6. Remove the position plate from the maxillary cast after the plaster has completely set, then articulate the first mandibular cast with the maxillary dental cast.

7. Pour vacuum-spatulated dental plaster (Lab Plaster, Regular; Dentsply Trubyte) into a mandibular plastic cast base, and fully insert the guide rails into the seats of the mandibular

^aVisiting Staff.

^bAssistant Professor.

^cAssistant Professor.

^dLecturer.

1 Maxillary cast placed on nonslip side of position plate with occlusal surface facing plate and its midpalatal plane matching symmetric scribe line on position plate.

2 Rear guide rails are placed into dovetails of maxillary plastic cast base and vacuum-spatulated plaster is poured into maxillary plastic cast base.

3 Position plate secured with maxillary cast is assembled with guide rails and maxillary plastic cast base to form base of maxillary cast.

4 Mandibular plastic cast base poured with plaster is assembled with guide rails and occluded maxillary and mandibular casts to form base of mandibular cast.

plastic cast base to form the base of the mandibular dental cast (Fig. 4).

8. After complete setting of the dental plaster, remove the first mandibular dental cast and bring the second mandibular dental cast into articulation with the maxillary cast.

9. Repeat the procedure in Figure 4 to form a second mandibular dental cast with a base identical to the first.

10. After complete setting of the plaster base of the second mandibular cast, remove the maxillary cast and bring the second maxillary cast into articulation with the mandibular cast. Pour vacuum-spatulated plaster into a maxillary plastic cast base and fully insert the guide rails into the seats of the maxillary plastic cast base to form the base of the second maxillary cast (Fig. 5).

11. Use 1 set of casts for the fol-

lowing diagnostic waxing procedure and save the other set as a record of the existing tooth position and, later, for fabrication of the surgical template.

12. Reposition the nonimplant arch first to determine how much tooth movement is needed in the arch intended for implants.

13. Section the teeth of the nonimplant arch from the cast with a dental die saw (William Dixon Co, Carlstadt, NJ), and reposition the teeth according to the orthodontic treatment plan. Secure the plaster teeth in position with paraffin wax (Shofu, Inc, Kyoto, Japan).

14. Reposition and secure the plaster teeth of the implant arch to the correct midline position, with normal vertical and horizontal overlap relative to the nonimplant arch.

15. Position artificial acrylic resin teeth (Shofu, Inc) in the proposed implant area to interdigitate correctly with the opposing dentition, and then secure the acrylic resin teeth with wax (Shofu, Inc) (Fig. 6).

16. Trim and attach the transparent ruled grid to the upper surface of the position plate. Assemble the diagnostic wax arrangement cast of the implant arch with guide rails and the customized position plate.

17. Draw the outline of the artificial acrylic resin teeth (Shofu, Inc) at the predetermined implant position on the position plate grid with a pen (Fig. 7).

18. Assemble the corresponding nonwaxing cast with the guide rails and the marked position plate.

19. Secure artificial acrylic resin teeth to the exact location transferred

5 Second maxillary plastic cast base poured with plaster is assembled with guide rails and occluded mandibular and second maxillary casts to form base part of second maxillary cast.

6 Comparison between original casts and diagnostic wax arrangement casts. Mandibular left first and second molars on diagnostic wax arrangement cast of patient were replaced with artificial acrylic resin teeth to be restored with fixed partial denture in future.

7 Predetermined implant position is marked on grid position plate with pen.

8 Two artificial acrylic resin teeth are secured to transferred implant position on original dental cast. Proposed implant position is easily discernible when viewed from top of customized position plate.

from the position plate onto the corresponding cast by direct visual inspection (Fig. 8).

20. Fabricate the surgical template with the proposed implant positions.

DISCUSSION

The advantages of the technique described are the convenience of duplicating the original dental casts and the efficacy of transferring the proposed implant position from the diagnostic arrangement cast to the original diagnostic cast. The disadvantages are the additional cost of the plastic cast bases, guide rails, and position plate. The proposed implant position may be transferred from the

cast of the diagnostic arrangement to the original cast with the assistance of the customized position plate by direct visual inspection. An alternative method to transfer the implant position is to use a laser pointer to project the markings on the position plate onto the original cast. Since the template is fabricated on the original diagnostic cast, the accuracy and fit of the surgical template is good. Sometimes an implant may be planned in the location of an existing tooth; this occurs occasionally when planned orthodontic treatment involves moving the tooth away from the proposed implant position. When an existing tooth is in the position planned for the implant, an orthodontic minis-

crew placed in the edentulous ridge may serve as a temporary anchorage to move teeth away from the implant position, and the dental implant may be placed after orthodontic treatment.

SUMMARY

A convenient technique to fabricate duplicates of the original diagnostic casts using plastic cast bases combined with a position plate is presented. The position plate is customized with a transparent ruled grid trimmed and attached on its surface to allow easy transfer of the proposed implant position from the diagnostic cast to the original cast.

REFERENCES

1. Kokich VG. Managing complex orthodontic problems: the use of implants for anchorage. *Semin Orthod* 1996;2:153-60.
2. Willems G, Carels CE, Naert IE, van Steenberghe D. Interdisciplinary treatment planning for orthodontic-prosthetic implant anchorage in a partially edentulous patient. *Clin Oral Implants Res* 1999;10:331-7.
3. Drago CJ. Use of osseointegrated implants in adult orthodontic treatment: a clinical report. *J Prosthet Dent* 1999;82:504-9.
4. Smalley WM. Implants for tooth movement: determining implant location and orientation. *J Esthet Dent* 1995;7:62-72.
5. Smalley WM, Blanco A. Implants for tooth movement: a fabrication and placement technique for provisional restorations. *J Esthet Dent* 1995;7:150-4.
6. Higuchi KW. Orthodontic applications of osseointegrated implants. Chicago: Quintessence; 2000. p. 23-5.

Corresponding author:

Dr Jenny Zwei-chiang Chang
School of Dentistry, College of Medicine
National Taiwan University
1 Chang-Te St
Taipei
ROC
Fax: 866-2-2383-1346
E-mail: jennyzc@ms3.hinet.net

Copyright © 2008 by the Editorial Council for
The Journal of Prosthetic Dentistry.

Receive Tables of Contents by E-mail

To receive tables of contents by e-mail, sign up through our Web site at <http://www.journals.elsevierhealth.com/periodicals/ympr>.

Instructions

Log on and click "Register" in the upper right-hand corner. After completing the registration process, click on "My Alerts," then "Add Table of Contents Alert." Select the category "Mosby" or type *The Journal of Prosthetic Dentistry* in the search field and click on the Journal title. The title will then appear, and having already completed the Registration process, you may add tables of contents alerts by accessing an issue of the Journal and clicking on the "Add TOC Alert" link.

You will receive an e-mail message confirming that you have been added to the mailing list.

Note that tables of contents e-mails will be sent when a new issue is posted to the Web site.