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Dent Clin N Am 50 (2006) 439–449

THE DENTAL
CLINICS
OF NORTH AMERICA

Simplified Impression Technique for Implant-Supported Crowns

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Dental implants have become a widely accepted method for replacing missing teeth. While many oral surgeons and periodontists are actively involved in the surgical placement of dental implants, many general dentists do not perform such placements because they are intimidated by the seeming complexity of the procedures and hardware. In response to perceived complexity, dental implant manufacturers have developed implant systems that facilitate and simplify impression-taking [1]. As such simplified protocols become more common, implant-borne restorations will become more widely used by the profession as a routine treatment modality.

The restorative phase typically begins during the diagnostic process preceding implant placement. At that stage the limitations and compromises are most easily recognized and accommodated. Also, that stage is best for determining the number and location of the implants. During this planning stage, surgical guides are often fabricated [2]. These guides communicate to the surgeon where the restorative dentist would like the implant placed. If an implant cannot be placed in the preferred location due to a lack of bone, grafting is performed to permit such placement.

A general restorative dentist is typically familiar with many of the basic restorative aspects of implant dentistry. Nevertheless, implant-supported restorations are distinctly different from tooth-borne restorations in that they require a mechanism for attaching the restoration to the implant. This component is termed the abutment [3].

The ITI Dental Implant System, known as a Straumann implant (Institut Straumann AG, Waldenberg, Switzerland), can be used predictably in

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doi:10.1016/j.cden.2006.03.006 *dental.theclinics.com*

partially and completely edentulous maxillae and mandibles with high success rates [4]. This article describes a simple technique for restoring a single-tooth posterior Straumann implant. This technique uses an impression cap or pickup coping, which is an impression coping that is automatically retained in the impression after removal from the mouth [3]. The advantage of this technique is that the impression caps, in conjunction with paired laboratory analogs and burnout copings, help ensure marginal detail and accurately relate the restoration to the implant abutment and the remaining teeth and soft tissue [2,5].

This technique has been used to teach implant restoration in the predoctoral implant program at the University of Kentucky College of Dentistry. This program has been in existence for over 6 years and has enjoyed a high rate of success. The primary emphasis is on mastering these relatively simple restorative techniques before preceding to more complex situations that may involve open-tray techniques and the like. The protocols used in this program are, in part, described below. Emphasis is placed on those steps that are unique to implant-borne restorations generally and, more specifically, the ITI system.

The standard clinical protocol is listed in Box 1.

Modified clinical protocol: adjusting the solid abutment

To adjust the solid abutment, the following modified clinical protocol is suggested:

1. After placing the solid abutment that most closely fits the interocclusal space, torque it to 35 Ncm. Adjust the abutment with a titanium-cutting carbide bur, such as the Brasseler H283FQ (Brasseler USA, Savannah, Georgia) or a crosscut fissure bur, taking care to avoid nicking the implant shoulder. A diamond bur can also be used. Check for adequate clearance. A finishing bur or fine-grit diamond should be used to create a slight bevel around the top of the abutment so as to remove any sharp edge created by the modification.
2. If a wide body Straumann implant (ie, wide neck solid abutment with a 6.5 mm shoulder) is used, the occlusal opening must be sealed with a flexible but durable material (eg, polyvinyl silicone) that can be easily removed if necessary.
3. Place an impression cap (white) over the shoulder of the implant. Again, there should be a definite ''snap'' or click and the impression cap should rotate around the shoulder of the implant. Because the abutment has been altered, the positioning cylinder cannot be used.
4. When making the impression, inject light body impression material through the holes in the top and lateral walls of the impression cap, then over and around the cap.

Box 1. Standard clinical protocol for restoring single-tooth posterior Straumann implant

1. Select the proper shade of porcelain.
2. Inject a polyvinyl silicone occlusal registration material over the implant healing screw, completely filling the edentulous space, and have the patient close into maximum intercuspation (Figs. 1 and 2). Allow the material to set. Remove the occlusal registration material and section it in a mesiodistal direction through the opposing functional cusp tip or tips. Measure the interocclusal clearance (vertical space) using a periodontal probe as depicted in Fig. 3 [6]. Then select the appropriate solid abutment based on the available vertical space: 4.0 mm (yellow/gold), 5.5 mm (gray/silver), or 7.0 mm (blue). For Straumann wide-neck implants (WNIs) select 4.0 mm (green) or 5.5 mm (brown).
3. Remove the implant healing screw (healing abutment) with the screw-carrying-system (SCS) screwdriver. Clean and dry the internal aspect of the implant. Align the vertical groove on the selected abutment with the laser-etched line on the outside of solid abutment driver. Carry the abutment intraorally in the driver, insert it into the implant, and tighten with finger pressure (Figs. 4, 5, and 6). If a WNI abutment is used, bring the abutment to the mouth with a SCS screwdriver. A gauze sponge should be ''unfolded'' and used to block the oropharynx so as to protect against aspiration should a component be lost in the mouth.
4. Check clearance with opposing teeth in maximum intercuspation (Fig. 7). If necessary, select a shorter abutment. If the laboratory technician determines that the interocclusal space is inadequate, the technician can shorten the laboratory analog, and then prepare a reduction coping, which the dentist uses to adjust the intraoral abutment at the appointment, during which the crown is cemented. If the shortest abutment (yellow/gold) interferes with opposing occlusion, the solid abutment will have to be adjusted (see below). If restoring the implant at the present shoulder location would give an unesthetic result, the shoulder of the implant may need to be prepared, as described below.
5. Place the boxed end of the ratchet and torque control device (torque wrench) over the driver handle. The directional arrow must be pointing in the clockwise direction and toward the torque bar with the teardrop-shaped end. If the torque bar is

on the counterclockwise side, flip the wrench over. If only the arrow is pointing in a counterclockwise direction, pull the arrow out, flip it over, and push it back into the handle. Using one hand to hold the holding key, use the other hand to grasp the tear drop and move the torque bar to the 35 Ncm mark (Figs. 8 and 9).

6. Place the white impression cap over the implant shoulder (Fig. 10). There should be a definite ''snap'' or click. When properly seated, the impression cap will rotate on the implant when gently twisted.
7. Line up the flat side of the positioning cylinder (It has a flat, raised tab.) with the flat side of the abutment. Slide the positioning cylinder completely onto the solid abutment. As this is a ''friction'' fit, there will be no ''snap.'' However, the lowest portion of the horizontal flange on the positioning cylinder must be flush with the superior edge of the white impression cap when properly seated (Fig. 11).
8. Make a final impression using polyvinyl silicone or polyether impression material, carefully syringing the impression material around the positioning cylinder and impression cap assembly (Figs. 12 and 13).
9. Upon removal of the impression tray, verify that the impression-cap–positioning-cylinder assembly are captured in the impression material and that the impression is an accurate negative reproduction of surrounding soft and hard tissues (Fig. 14). The impression cap and positioning cylinder should fit together tightly. If there is impression material between the positioning cylinder and the impression cap, this indicates that the cap was either not fully seated or was dislodged during the impression-making process (Fig. 15). If this is the case, the impression procedure must be repeated.
10. Do not remove the abutment. Provisionalize the abutment with the accompanying protective cap or fabricate a provisional crown. Cement with temporary cement.

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Modified clinical protocol: adjusting the shoulder of the implant

To adjust the shoulder of the implant, the following modified clinical protocol is suggested:

Fig. 1. Implant healing cap.

1. Using previously described procedures, select a solid abutment, and torque it to 35 Ncm. Evaluate the relationship of the implant shoulder to any adjacent implants, teeth, and to the gingival crest. If adjacent implant shoulders touch each other or if the implant shoulder is exposed, thus creating a condition for an unacceptable esthetic result, the shoulder of the implant should be adjusted. The abutment will likely be adjusted as well.
2. If a wide-neck Straumann implant (wide neck solid abutment with a 6.5 mm shoulder) is used, the occlusal opening must be sealed with a flexible but durable material that can be easily removed if necessary.
3. The shoulder can be prepared with conventional diamonds. However, bur companies manufacture burs with specific metallurgical properties that make them more suitable for preparing titanium implants. Dentists who restore implants should have a small supply available for making these adjustments.

Fig. 2. Polyvinyl silicone interocclusal registration in maximum intercuspation.

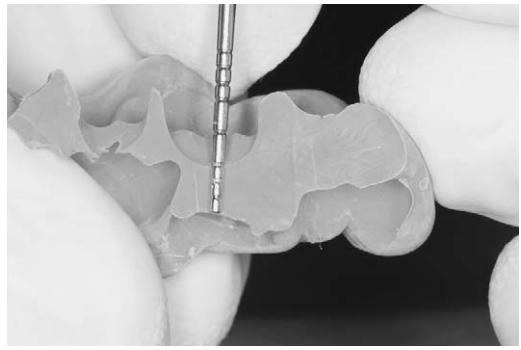

Fig. 3. Measuring interocclusal clearance.

Fig. 4. Solid abutment and driver.

Fig. 5. Aligning mark on driver with groove on abutment.

Fig. 6. Abutment in place; hand tightened only.

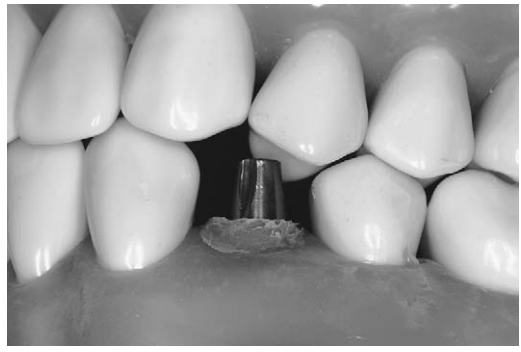

Fig. 7. Checking interocclusal clearance.

Fig. 8. Torque wrench and holding key in place.

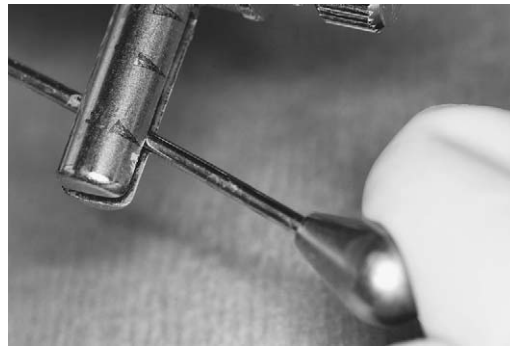

Fig. 9. Torqued to 35 Ncm.

Fig. 10. Placing impression cap.

Fig. 11. Placing positioning cylinder.

Fig. 12. Syringing impression material around cylinder and cap.

Fig. 13. Light body impression material over cylinder and cap.

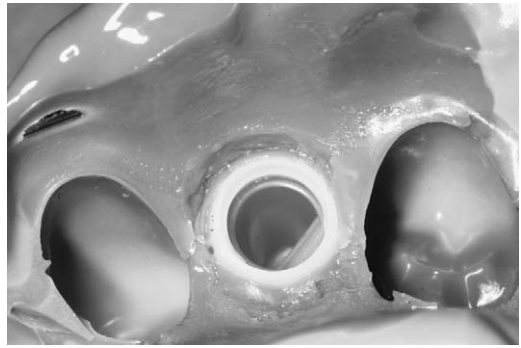

Fig. 14. Accurate impression with correct position of cylinder and cap.

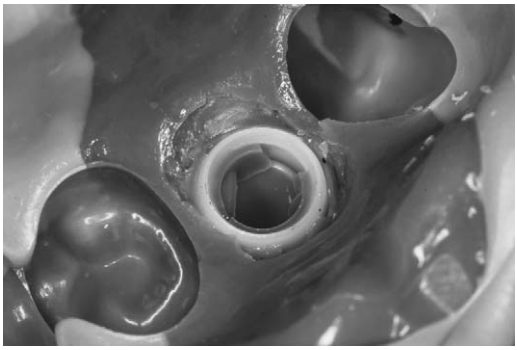

Fig. 15. Malposition of cylinder and cap.

4. Once the shoulder has been lowered to either create clearance or a more esthetic finish line, a conventional crown and bridge technique is used to make the impression. Use gingival retraction techniques and materials to expose the new finish line. Impression caps and positioning cylinders cannot be used if the ITI implant shoulder has been altered.
5. Inform the dental laboratory technician that the implant shoulder has been altered so materials and methods can be altered accordingly. It is possible to create an index coping to communicate to the lab how much material was removed. This is done by placing a small amount of fast-setting resin, such as the resin used to index cast frameworks for fixed partial dentures. After this resin sets, the top of the resin index is gently reduced in height with a bur or diamond until it is flush with the modified abutment surface. This is then removed and sent to the lab, where it can be placed on the analog, thus providing a guide so that the technician can reduce the implant analog by an appropriate amount.

Laboratory phase

The laboratory phase of this technique involves the following four steps:

1. In the dental laboratory, the corresponding analog is positioned in the impression. The shoulder should audibly click into place. To optimally contour the crown, always use a gingival moulage. Using conventional techniques, a working model is fabricated from die stone.
2. An appropriate plastic coping is selected and pressed onto the analog until it clicks into place, and then reduced to the height of the abutment. Subsequently, wax is overlaid on the plastic coping to create the crown's metal substructure.
3. After casting, the "snap-on" lip must be removed with a reaming tool. Then, the cast coping is fitted onto the analog.
4. Finally, the structure is trimmed and veneered with porcelain according to anatomical guidelines.

Seating and cementation of the crown

The process of seating and cementing the crown requires four steps:

1. Seat the crown and evaluate interproximal contacts with dental floss.
2. Make occlusal adjustments, similar to that of a natural tooth, with light occlusal force, eliminating occlusal contacts. Establish final maximum intercuspation contacts with a heavy occlusal force.
3. Because dental implants most effectively resist forces directed axially, lateral forces on posterior implant-supported crowns must be minimized for long-term success. Therefore, flatter inclines with no eccentric contacts are essential [7].
4. When completely seated and adjusted, cement the veneered crown onto the intraoral abutment.

Summary

Using well-designed dental implant systems, oral surgeons or periodontists and general dentists can collaborate to provide their patients esthetic and functional replacements for missing teeth. When used to replace posterior teeth, Straumann solid body abutments may be impressed with relatively simple techniques and the resultant crowns seated and cemented with only minor modifications to traditional protocols.

References

[1] Misch CE. Prosthetic options in implant dentistry. In: Misch CE, editor. Contemporary implant dentistry, edition 2. St. Louis (MO): Mosby; 1999. p. 67–72.
[2] Howe L, Barrett V, Palmer P. Dental implants. 7. Basic restorative techniques. Br Dent J 1999; 187:473–9.
[3] Sarment DP, Peshman B. Manual of dental implants. Hudson (OH): Lexi-comp, Inc.; 2004.
[4] Cochran DL. The scientific basis for and clinical experiences with Straumann implants including the ITI Dental Implant System: a consensus report. Clin Oral Implants Res 2000; 11(Suppl 1):33–58.
[5] Kaiser DA, Jones JD. New impression system for ITI solid abutment cementable restoration. J Prosthet Dent 2000;83:276–8.
[6] Williamson RT, Robinson FG. Record for measuring interocclusal distance in fixed implant prosthodontics. J Prosthet Dent 2001;86:666.
[7] McGlumphy EA. Implant-supported fixed prostheses. In: Rosenstiel SF, Land MF, Fujimoto J, editors. Contemporary fixed prosthodontics. 3rd edition. St. Louis (MO): Mosby; 2001. p. 313–55.