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A Laboratory Procedure for Optimal Implant Abutment Preparation

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Abstract

Simplicity and predictability have made cement-retained implant crowns the recent restoration of choice. The taper of the abutment is of particular importance for cement-retained implant restorations. The ideal taper of the implant abutment allows the clinician to control the overall retention of restorations. The technique described in this report presents the laboratory preparation of an implant abutment for a cement-retained crown using a counter gauge to control the preparation taper.

Cement-retained implant restorations (CRIRs) continue to gain popularity, and their simplicity and predictability often make them the restoration of choice. Several factors influence the retention of cement-retained fixed restorations (CRFRs), either fabricated on natural teeth or on implant abutments. These factors are (1) taper or parallelism, (2) surface area and height, (3) surface finish or roughness, and (4) type of cement.[1-3]

The taper of the natural tooth abutment has a significant influence on the amount of retention generated in a CRFR. Jorgensen[2] established that a 6° taper is ideal in abutment preparations. For conventional fixed prosthodontics, the literature suggests that most practitioners prepare natural teeth with a taper between 15° and 25°. A 15° taper provides approximately one-third of the retention of the ideal 6° taper, while a 25° taper provides approximately 25% or one quarter of the retention generated by the ideal taper. As a result, when cemented to natural teeth, fixed partial dentures have one-third to one-fourth the retention of the ideal 6° taper.[1]

The ideal taper of the implant abutment and the longer walls dictate the use of provisional cement for long-term retention. This allows the operator to control the overall retention of restorations by using a weaker cement to offset the superior retentive features of the implant abutment.[1,4]

Several options are available to the restoring dentist for the preparation of implant abutments for cement retention. Abutments can be prepared intraorally when conditions permit, or the laboratory may prepare the abutments and then directly fabricate the definitive restoration.[5]

There are several advantages to preparation of the implant abutment in the laboratory: (1) there is decreased chair time, because the preparations and metal work are fabricated by the laboratory, (2) the primary impression requirements are less demanding, because small bubbles or voids do not affect abutment transfer, and margins are not important to record, (3) the laboratory may choose the right component for an implant abutment more easily, and (4) 3D examination of the working area is possible. Moreover, custom abutments may be fabricated as well.[5]

The technique described in this report presents the preparation of an implant abutment in the laboratory with the use of a counter gauge and a dental surveyor together for a CRIR. In this technique, neither a silicone key nor remounting of the casts to the articulator is necessary for occlusal space control. Therefore, a counter gauge can be considered as a cost-effective, easy-to-use device that leads to fewer time-consuming procedures during the preparation of the implant abutment on the dental surveyor.

In this procedure, an implant mount was used as an abutment for the CRIR. The implant mount can function as an impression post for the fabrication of a definitive cast, and then can be prepared on the final cast in the dental laboratory to function as a definitive abutment. These previously mentioned features are attributed to the implant system by the manufacturer to minimize chair time and financial investment.[6]

Technique

1. Connect the implant mounts (SwissPlus, Zimmer Dental, Carlsbad, CA) to the implants intraorally, and make the definitive impression with standard techniques.[7] Make

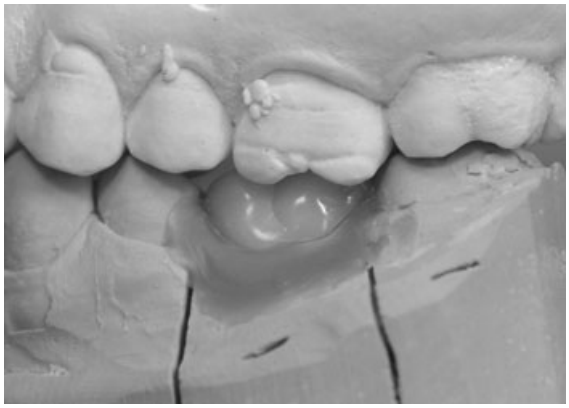

Figure 1 Development of occlusion with an artificial tooth on a definitive cast.

the opposing arch impression with an irreversible hydrocolloid impression material (Cavex outline, Cavex Holland BV, Haarlem, The Netherlands) using a stock tray (EXF204 impression tray upper, perforated mirror finish-medium, Lascod Spa, Firenze, Italy).

2. Pour the definitive cast from type IV dental stone (type IV, Galaxy, Ultima, Lafarge, Seiches Sur Le Loir, France) and fabricate a soft tissue (Gingifast elastic, Zhermack GmbH, Marl, Germany) cast for a single-tooth implant using routine laboratory procedure.[5]
3. Fabricate removable dies with a pin system (Ultipins, Lafarge Prestia Co. Ltd., Chalburi, Thailand), leaving the edentulous segments intact as a single unit.
4. Mount definitive casts on a semi-adjustable articulator (Stratos 100, Ivoclar Vivadent, Schaan, Liechtenstein) using maxillomandibular relationship records and a facebow transfer (UTS facebow, Ivoclar Vivadent).
5. Remove the silicone soft tissue masque (Gingifast elastic) and implant mount (SwissPlus) from the implant analog (OPR, Zimmer Dental). Position a prosthetic tooth (Yamahachi acrylic resin teeth, Yamahachi Dental Mfg., Co., Gamagori City, Japan) on the implant analog on the definitive cast to be used for occlusal plane development; this will assist in the creation of the correct position and the contour of the definitive restoration (Fig 1).

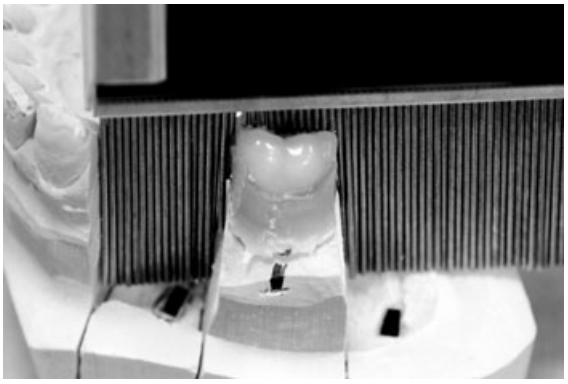

Figure 3 Counter gauge placed on an artificial tooth for space record.

6. Take out the removable adjacent tooth sections on the definitive cast.
7. Mark the middle of the buccal/lingual and mesial/distal interproximal surface projections of the artificial tooth on the definitive cast with a pencil line (Fig 2).
8. Use a counter gauge (Empire Level Mfg. Corp., Mukwonago, Taiwan) to record the mesiodistal/buccopalatinal contour and the position of the artificial tooth with the aid of the pencil lines on the definitive cast. Check the space available for an implant abutment on the counter gauge by inspection (Figs 3–5).
9. Remove the prosthetic tooth from the definitive cast and attach the two-piece nonrotational abutment (OPA/5, Zimmer Dental) to an implant analog (OPR) on the definitive cast (type IV, Galaxy) (Fig 6).
10. Place the definitive cast on the dental surveyor (AF200, Amann Girrbach AG, Koblach, Austria). Adjust the insertion path of the restoration on the dental surveyor. Shorten the implant abutment with a rotary disk (Diameter: 38.1 mm and thickness: 1 mm, item no. 210, Dentorium, New York, NY) 2 to 3 mm directly inferior to the incisal edge position of the planned final crown according to the counter gauge record (Fig 7).
11. Reduce the facial profile of the incisal one-third and finish the abutment preparation by means of a counter gauge with the tapered diamond burs (Komet H.356RSE,

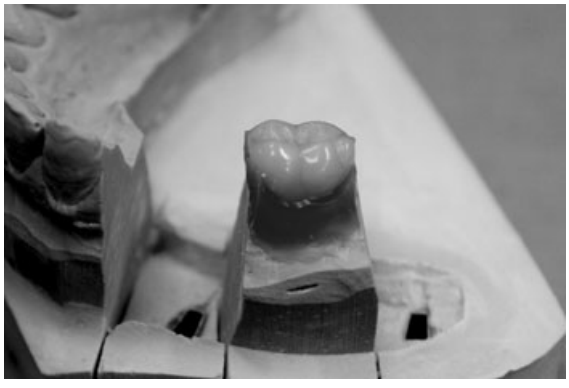

Figure 2 Adjacent removable parts taken out.

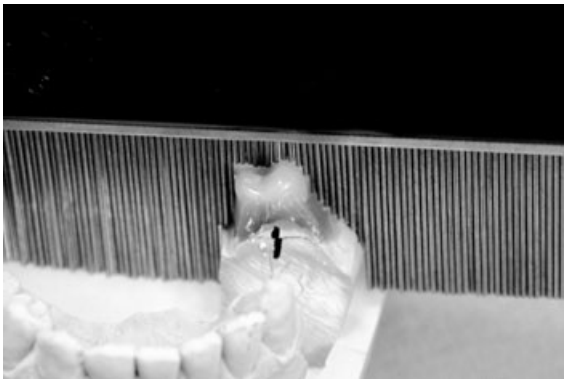

Figure 4 Counter gauge placed on an artificial tooth for space record.

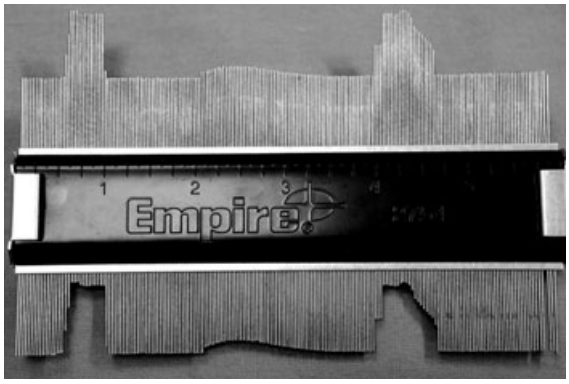

Figure 5 Counter gauge after record.

Figure 6 Two-piece nonrotational implant abutment on a definitive cast.

size 031, 4°, Brasseler Gmbh Co. KG, Lemgo, Germany) developing an approximately 3 to 4° taper on each side or a 6° to 7° total taper similar to natural tooth preparation (Fig 8).

12. Prepare the final facial and interproximal restoration margins in the esthetic region 1 to 1.5 mm below the gingival height of contour in the definitive cast, creating a chamfer finish line. Control the prepared abutments' mesiodistal and buccolingual contours with the help of the counter gauge by inspection (Fig 9). Once the preparation is complete, the crown can be fabricated.

Figure 7 Counter gauge replaced on the definitive cast to be a guide for the implant abutment preparation.

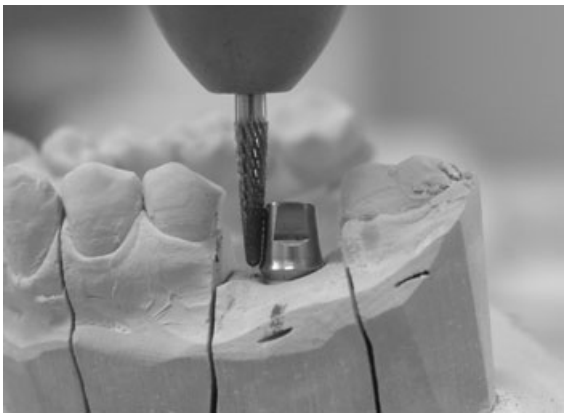

Figure 8 Preparation of the implant abutment with a 4° tapered diamond bur.

Figure 9 Prepared implant abutment with the guidance of the counter gauge.

Summary

Cement-retained implant restorations continue to gain popularity. The taper of the abutment has a significant influence on the amount of retention generated for cement-retained implant restorations. The technique described in this report presents the laboratory preparation of an implant abutment for a cement-retained crown using the aid of a counter gauge to control the taper. The counter gauge is a cost-effective, efficient, and easy-to-use device that allows 3D examination of the working area during the implant abutment preparation.

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