DENTISTRY TODAY
www.dentistrytoday.com
Circulation 150,000
VOLUME 22 NO. 6 THE NATION'S LEADING CLINICAL NEWS MAGAZINE FOR DENTISTS June 2003

Molar Crowns That Are Faster, Better, and More Enjoyable

By Thomas E. DeLopez DDS

Providing high-quality porcelain-fused-to-gold or full-cast gold crowns for molars or second bicuspids should be one of the most predictable, profitable, and enjoyable procedures that a general dentist performs.

This article presents systems for creating an ideal crown preparation on every tooth and making a very accurate dual-arch, closed-bite impression that is easy on the patient and will save the doctor and patient time and money. Fabricating stabilizing temporary crowns is briefly discussed. Ultimately, the dentist and laboratory produce a high-quality crown for the patient with less time, energy, and stress.

PREPARATION

The tooth should be prepared with the objective of creating an ideal foundation for the laboratory to produce a crown that is within the structural limitations for the selected material while preserving as much sound tooth structure as possible. The dentist must understand

When ideal crown preparations become routine, the entire procedure can become so predictable and successful that it is actually stress-free fun.

the structural limits of the metals and porcelains used in the crown so the preparation can be designed to achieve a predictable and durable restoration.

Factors that affect the accurate replication of the prepared tooth in the impression material and in the die material should be considered. Undercuts, sharp corners, and ragged edges should be avoided, since they cause excessive deformation of the impression material as it is removed from the mouth, and they cannot be replicated with die stone or resin. To meet the previously stated objectives, almost every crown preparation will require that the voids created by the removal of old restorations, decay, or broken cusps be filled with some type of buildup material.

Technique

First, the most accessible part of the tooth—the occlusal surface—is quickly reduced. This removes much of any old restorative material in the tooth, and at the same time reduces the surface area of the more-difficult-to-reach buccal, lingual, and interproximal areas.

Next, a bulk reduction of the buccal and lingual surfaces is performed using as large a diamond as you can control. Take extreme care not to touch the gingiva and initiate any bleeding. This is followed by removing the old restoration and any decay. The amount of decay that exists under apparently sound restorations is truly astounding.

The tooth is now ready to receive the buildup material. If it is a routine preparation with small to medium sections to be rebuilt, a dual-cured, resin-reinforced glass ionomer will be used. The preparation is disinfected with chlorhexidine gluconate or benzalkonium chloride while the assistant prepares a dual-cured, resin-reinforced glass ionomer. This material is then injected into the voids created by the removal of the restoration and decay, and light-cured. There are many acceptable crown buildup materials that can be applied without etching and bonding.[1,2] My choice is Fuji II LC Improved (GC America, Figures 1 through 4).

Removing the old restoration and placing a buildup may take an additional 5 minutes, but it consistently saves 10 to 15 minutes at the delivery appointment. Clinically, the disinfection and buildup seems to decrease postoperative sensitivity. Also, the dentist is assured that the buildup is free of voids, rather than hoping that cement will fill any voids created when the laboratory blocks out undercuts. Additionally, there is great personal satisfaction in producing an ideal crown preparation every time.

If insufficient tooth structure remains, if there is gross decay, or if root canal treatment has been performed, then a bonded composite core will be placed. A buildup fee will be charged for this procedure and should be discussed with the patient in advance of the appointment. With a severely broken down tooth, do not rely solely on this bonded core to retain your crown, but create a ferrule of 2 mm on sound tooth structure for antitorquing and retention.

After the buildup procedure, complete the preparation with the diamonds of your choice. Remember, the largest diameter diamond that can be used will produce the smoothest preparation, since it is less likely to gouge the tooth surface than a thin diamond.

Finally, every preparation is checked for adequate occlusal reduction with a color-coded, flexible clearance gauge, and any sharp angles are rounded (Figure 5). After more than 30 years and thousands of crowns, I still check every crown with a Belle de St. Claire clearance gauge. Patients have no problem with the "rounding of a sharp point" on the opposing tooth at the time of preparation, but no one is pleased if the dentist "grinds on their teeth" or adjusts porcelain until metal shows on their new crown at the time of delivery.

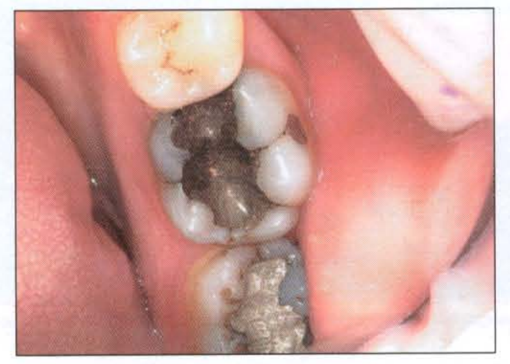


Figure 1. Preoperative.

Figure 2. After bulk reduction and decay removal.

Figure 3. Dual-cured resin/glass ionomer buildup.

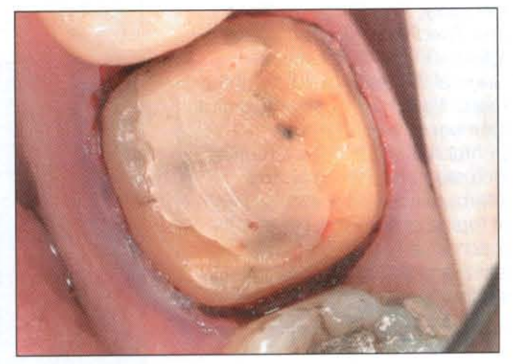


Figure 4. Final preparation.

Figure 5. Occlusal clearance is verified.

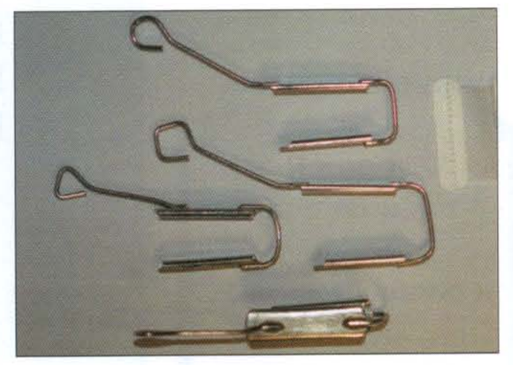


Figure 6. Temrex Bite Relator trays.

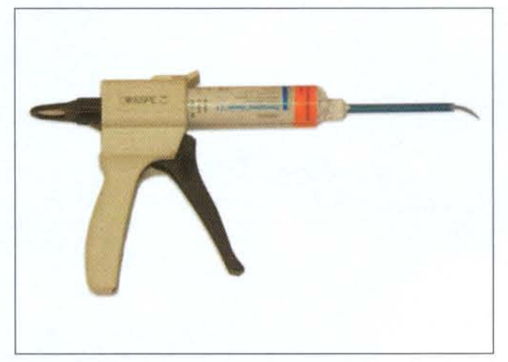


Figure 7. Light-body Permadyne Garant, in gun.

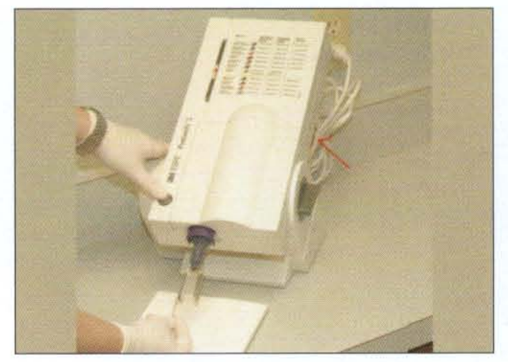


Figure 8. Impregum Pentamix machine.

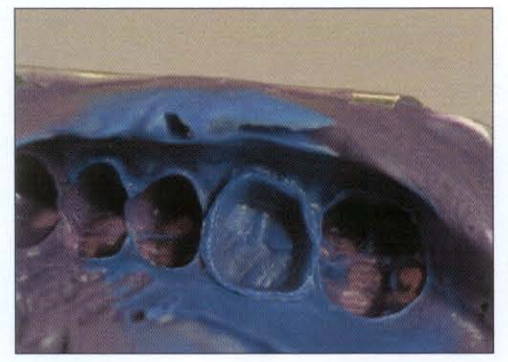


Figure 9. Final impression. Note that light passes through the thin occlusal areas on the adjacent teeth, indicating complete closure into centric occlusion.

Figure 10. Temporary crown.

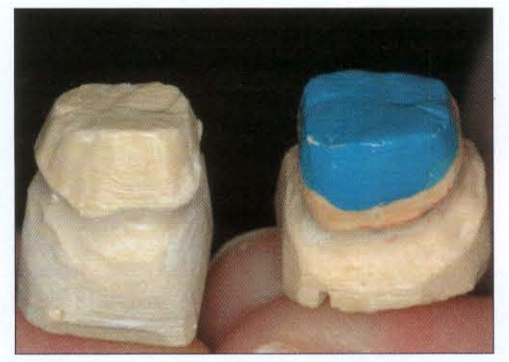


Figure 11. Typical dies, one before die spacer was added, one after fabrication of a crown.

Figure 12. Final crown.

IMPRESSIONS

Carefully equilibrated full-arch models mounted with face bows on fully functional

articulators are clearly indicated for complex restorative procedures.[3] However, is a single second bicuspid or molar crown produced from a dual-arch, closed-bite impression in a metal tray, as will be described in this article, a better value and service for the patient?

Using the criteria discussed in this article, a dual-arch, closed-bite impression will produce high-quality, predictable results. The procedure is easy on the patient, eliminating the need for full-arch upper and lower impressions while capturing the upper and lower arch segments along with the bite at the same time with a quality impression material. Many patients express gratitude for this comfortable impression technique.

Tray selection is of utmost importance. The tray must be rigid and allow for no flexing when the impression is made or removed. At the same time, the patient must be able to close completely while the tray remains totally passive in the mouth. This requires a metal tray with a thin-but-rigid distal connector. The Temrex Bite Relator trays, which come in a regular and wide width, meet these criteria. A plastic tray that flexes and rebounds is worthless for a master impression; the impression might look good, but the crowns will not fit consistently (Figure 6).

Technique

Before the tooth is prepared, the patient is asked to bite, and the occlusal relationships of the cuspids, lateral incisors, and bicuspids are observed on the opposite side of the arch. The Temrex tray is then placed in the mouth, and the patient is asked to close. The occlusal relationships, as noted previously, should be the same. The impression tray must be totally passive and comfortable. This is verified by moving the tray handle up and down about a half inch with very light pressure while the patient is closed in centric occlusion. Wisdom teeth, mandibular tori, and wide retromolar tuberosity areas often prevent the patient from closing comfortably. In most cases, this problem is solved by using the widest Bite Relator tray. If the patient cannot or will not bite completely with the checkbite tray in place, abandon this technique and use a full-arch impression.

Both vinyl polysiloxane and polyether impression materials produce excellent results. However, when evaluating the margins and preparation detail under 10x power magnification on the lab bench, superior results were achieved with a combination of Impregum Penta Soft (3M ESPE) and light-body Permadyne (3M ESPE). Clinical evaluation of contacts, occlusion, and marginal fit when using this combination of polyether materials also seems to produce superior results. This is probably because of the fact that the polyether is more hydrophilic, which is beneficial when making impressions subgingivally and when pouring the dies.[4] In addition, polyether impression materials are very rigid when set. This is an advantage when making closed-bite impressions.

Removal of these dual-arch impressions made with rigid polyether materials is not as difficult as it sometimes is with full-arch upper impressions. However, to prevent this rigid impression material from locking into undercuts, it is advised that the dentist block out underneath bridges and interproximal areas that are not filled with an interdental papilla. I use Play-Doh modeling compound for this purpose.

To make the impression, the assistant loads the Temrex tray with Impregum Soft from the Pentamix machine. At the same time, the dentist injects light-body Permadyne Garant material around the preparation and adjacent teeth. The tray is gently placed into position, and the patient is asked to close on the back teeth. The occlusal relationships on the opposite side of the arch are evaluated. If the bite is protruded or off to one side, calmly ask the patient to close on his back teeth without opening, and most often he will close into centric occlusion. If he opens or "chews," your impression is ruined. Be sure to remind the patient that he must stay closed for 5 minutes while the impression sets. Failure to do so may result in the patient opening when you evaluate the bite and remark that it is ideal. After centric occlusion is verified, a timer is set for 5 minutes, thus allowing the required 6 minutes of setting time for the Permadyne (Figures 7 through 9).

When the impression is removed, evaluate not only the margins, but ensure that some light passes easily through thin areas on the occlusal surfaces of the nonprepared teeth, indicating that the patient's bite was completely closed. Be sure that no part of the prepared tooth is touching metal of the tray (this is especially a problem on upper second molars). If the patient does not bite completely into centric occlusion for the impression, it is impossible for the laboratory to accurately relate the models. Relying on any interocclusal records other than a correct initial impression is unpredictable.

TEMPORIZATION

A custom-made temporary crown is required to provide for stabilization of the prepared tooth and the teeth that it contacts both interproximally and occlusally. In many states, fabrication of temporary crowns may be delegated to dental assistants. In this situation, quality assurance is the responsibility of the dentist.

Technique

Before any treatment is performed, a preliminary impression is made using a plastic, dual-arch impression tray with an inexpensive fast-set vinyl polysiloxane bite registration paste. This will be the template for the temporary fabrication. It also prepares the patient for the final impression, which is similar but requires more time.

If the tooth to be crowned is badly broken, it can either be blocked out prior to this preliminary impression, or the set impression can be altered with a dental bur.

After the crown preparation is completed, place the acrylic of your choice into the template, which is then seated and held in place by the patient closing lightly. When the acrylic achieves a preliminary set, it is removed from the patient's mouth. It is ideal if the temporary crown remains in the preliminary impression, where it bench hardens.

If the temporary crown is made before the impression, the preparation and adjacent teeth are scrubbed with a chlorhexidine soap to remove any residue from the acrylic.[5] This is especially important if using a vinyl polysiloxane impression material, since the residue may adversely affect the set of this material.

When the temporary crown has been completed, the dentist evaluates the marginal coverage, interproximal contacts, and occlusal stops prior to cementation (Figure 10). The preliminary impression is disinfected, labeled, and placed in a plastic sandwich bag for emergency use should the temporary crown break or be lost.

LABORATORY PROCEDURES

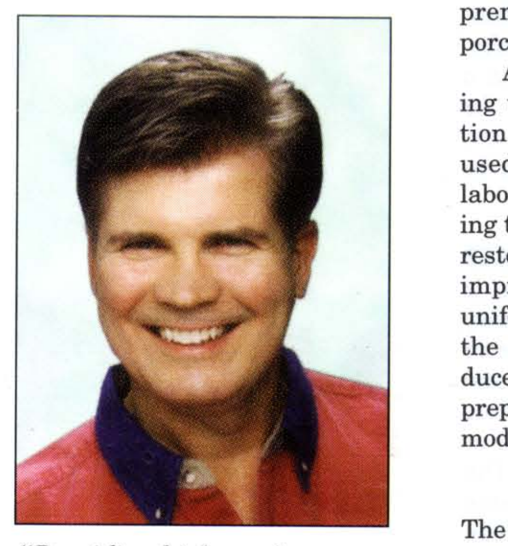
A neat, small impression is presented to the laboratory that contains the master cast, the opposing model, and the bite registration. This impression can be poured at the lab's convenience. The possibility of an inaccurate opposing model has been eliminated. Pulls and irregularities on the side of the master cast opposite the prepared teeth no longer require tedious equilibration. The lab's job has been simplified, provided the dentist captures an accurate centric occlusion.

Just as the dentist must capture centric occlusion, it is of utmost importance that both sides of the model be poured and mounted before they are removed from the impression. If the models are separated before mounting, the occlusal relationship will be permanently lost.

When restoring a single molar or second bicuspid to acquired centric occlusion, the lab is instructed to create centric occlusal stops and to disclude the tooth in any lateral or protrusive movements. A plastic or metal quadrant articulator can be used. The articulating device must reliably return the teeth to centric occlusion. In addition, this articulating hinge should allow for the lab technician to move models laterally against the cusp of the adjacent teeth to ensure that there are no interfer- addition, this articulating hinge should allow for the lab technician to move models laterally against the cusp of the adjacent teeth to ensure that there are no interferting crown. When the preparation is not built up, the lab can take 2 approaches to produce a crown that will fit the die (Figure 11). Most often, a functional die is created by gross block-out of the prepared tooth before beginning the crown. The lab is designing the preparation for the dentist so the crown will look good on the model and fit the margins. However, when delivered to the patient, these crowns are very loose fitting, and it is difficult to obtain a definite seat, since the crowns are floating on the prepared tooth. Also, it is impossible to ensure that there are no voids in the cement that is filling these large blocked-out areas when the crown is permanently seated.

If the dentist requests a tight-fitting crown, the lab will do minimal blocking-out. The accurate duplication of a preparation with gross irregularities in the impression process and in die fabrication is not possible. The crown will fit the die. However, these nonreplicated irregularities often prevent complete seating of the completed crown on the prepared tooth without grinding on the inside of the crown or the tooth, a tedious and time-consuming procedure. Furthermore, with PFM crowns, there cannot be a uniform thickness to the metal substructure if gross irregularities exist in the preparation. These thick and thin areas of metal cause problems with the heating and cooling cycles required for bonding porcelain to the metal substructure. The irregular substructure flexes slightly when cooling, producing microscopic fractures in the porcelain that may lead to premature failure of that porcelain.

Another benefit to building up every crown preparation is that less metal is used, thus decreasing the laboratory cost while increasing the durability of the PFM restoration. With a quality impression and a smooth uniform crown preparation, the laboratory should produce a crown that fits the prepared tooth like it fits the model.



"Providing high-quality porcelain fused to gold or full cast gold crowns for molars or second bicuspids should be one of the most predictable, profitable, and enjoyable procedures that a general dentist performs."

Thomas E. DeLopez, DDS
Page 64

DELIVERY

The dentist checks the crown on the model for occlusion, contacts, and ease of removal and seating on the die before the patient arrives. When the patient is seated, the temporary crown is removed and the permanent crown is placed on the tooth. Generally, it fits easily into place (Figure 12). The patient is instructed to bite on a cotton roll for a few minutes, which settles the contacts into place. The contacts and margins are evaluated, then the occlusion is checked and final adjustments are made before cementing the crown.

CONCLUSION

Dual-arch, closed-bite impressions are reliable, easy on the patient, and save time and material. The trays must be rigid and fit passively. Polyether impression materials are particularly well-suited for this type of impression. All preparations should be built up to facilitate accuracy in impressions and in die models. Ideal preparations allow the laboratory to work within the material specifications for PFM crowns and to produce durable crowns that fit well.

The time spent on buildups at the preparation appointment will be more than made up at the delivery appointment. The number of premature porcelain fractures will be reduced, and lab cost may be decreased. Single molar and second bicuspid crowns will be easier, faster, and more profitable than ever before. When ideal crown preparations become routine, and the patient's adverse reaction to full-arch impressions is eliminated, the entire procedure can become so predictable and successful that it is actually stress-free fun.✦

Acknowledgment

The author would like to thank Rockwell Labs in Tallahassee, Fla.

References

1. Resin/Glass ionomers. *Reality*. 2002; 16:631,633.
2. Goldstein MB. Rapid-fire crown buildups. *Dent Today*. 2002;21(7): 104-107.
3. DeLopez TE. Limited and phased treatment of worn anterior teeth. *Dent Today*. 2002;21(10):82-85.
4. Jia W, Sorensen JA. Wet detail repro-

Dr. DeLopez spent 3 years in the US Army as a dental officer, then entered private practice in Tallahassee, Fla, in 1974. He is the former president of Leon County Dental Association and maintains a full-time practice that emphasizes restorative and cosmetic dentistry. Dr. DeLopez writes and lectures on crown and bridge dentistry and doctor/laboratory communications. He can be reached at drtomd@nettally.com.