

The Rationale for the Vented-crown Technique and Its Application in Today's Dental Practice

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INTRODUCTION

It would be safe to assume that the integrity of a full coverage restoration is directly related to its marginal fit. Complete, unimpaired seating of a full coverage restoration can be significantly affected by hydraulic pressure from the cement.¹⁻² Hydraulic pressure, created by seating a restoration, especially a well-fitting one, can result in a final marginal gap that is clinically unacceptable. Incomplete seating due to hydraulic pressure is a greater problem with posterior teeth. The large, flat occlusal surface of this type of preparation creates a large well or platform for cement to pool and prevent seating. Also, preparations with long, parallel walls and a large occlusal surface are even more of a concern. Anterior preparations tend to be more conical in shape and have no or minimal occlusal table. They may be less affected with the problem of hydraulic pressure.³

Improving the marginal fit of restorations can help to prevent the problems of open margins, cement washout, recurrent decay, poor gingival health and disrupted occlusion. The seating of a full coverage restoration can be improved significantly by using external venting,^{1-2,4-6} a die spacer⁷⁻⁹ and internal venting.^{3,10-12}

When the literature is consulted, it is consistently found that, when no relief is used, the marginal gap can vary from 200-100 μ , based on the theory of hydraulic pressure.^{1-6,10-14} Using a die spacer will reduce the marginal gap to 60 μ .¹³⁻¹⁴ The best seating, close to 20 μ , was achieved when an external vent with die spacer was used.^{1-2,4-6} Different cement types do not seem to play a significant role in the marginal fit if a die spacer and external venting are used.¹³⁻¹⁵ Marginal design also does not seem to affect marginal fit, if a die spacer and/or vents are used.¹⁶ Actually, the better the casting fits at the margin, the more there is need for relief during seating, because hydraulic pressure has the potential to be a greater problem. An oversized, poor fitting casting cannot build-up as much hydraulic pressure.

Venting to reduce internal hydraulic pressure may also have additional benefits with porcelain fused-to-metal crowns. Research indicates that internal hydraulic pressure can deform a crown and possibly contribute to premature porcelain fractures.¹⁷⁻¹⁸ The escape provided by the vent is a great way to reduce these internal hydraulic pressures and the potential for lateral deformation during seating.

The use of a single internal vent channel placed on the wall of a preparation has also been shown to improve the seating of a full coverage restoration.^{3,10-12} The escape channel needs to be placed as close as possible to the margin and facilitate the release of excess cement. If the escape channel is under extended, in the

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range of 2 mm or greater from the margin, the benefit of this technique is lost. This technique has shown results in the 40–50 μ range for marginal gap sizes. It is a simpler technique and does not require a vent hole to be repaired.

The goal of obtaining the best marginal fit seems to lie with using the die spacer and an external vent. The ease of using a die spacer alone will provide consistent margins of 60 μ , which may very well be clinically acceptable. However, when the extra step is taken with an external vent, the following benefits are achieved:

- A threefold improvement of the marginal fit to 20 μ .^{1-2,4-5}
- A decrease in internal hydraulic pressure, which can cause lateral deformation of a crown and possible porcelain fracture.¹⁷⁻¹⁸
- A decrease in internal pressure, which minimizes cement forced into dentinal tubules.¹⁹⁻²⁰
- An improved post-cementation occlusion.²⁰
- Improved retention and possible lifespan of a restoration.²¹

This article reviews a simplified external venting technique first described by Basset² and later by Seberg.²² This technique will be extrapolated to porcelain fused-to-metal crowns. The technique demonstrates a simple, yet effective, way to seal the external vent hole. Once the vent hole is sealed with a gold pin and polished, it is practically invisible. An example will also be shown and briefly discussed with a case using an internal vent.

I. Review of the Technique for Externally-vented Gold Crown or Porcelain Fused-to-Metal Crowns

A. Preparation

1. Prepare the tooth as you would any preparation—the margin design of your choice.
2. Place a small dimple on the crown preparation where the vent hole will be, usually at the MB cusp on a gold crown and at the distal aspect of an occlusal surface on porcelain fused-to-metal.
3. Impress and provisionalize, as you normally would.

B. Laboratory

1. Wax-up the crown or porcelain fused-to-metal coping. For the coping, a metal stack or chimney should extend to the occlusal surface at the vent site.
2. In the wax-up, make the vent hole from the inside surface. Use a small twist drill, warm,



Figure 1. Internal aspect of crown with vent hole.

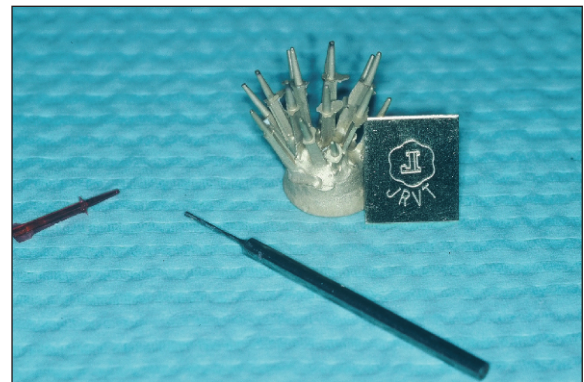


Figure 2. Burnout pin, precast pins, JRVT gold and twist drill.



Figure 3. PFM crown with vent chimney and pins.

if necessary, and do by hand. Vent the hole usually on the MB cusp of the gold crown or vent the hole to go through the metal chimney in a porcelain fused-to-metal crown.

3. The wax-up is then invested carefully to ensure that the investment flows through the vent hole and no air is trapped in the vent.

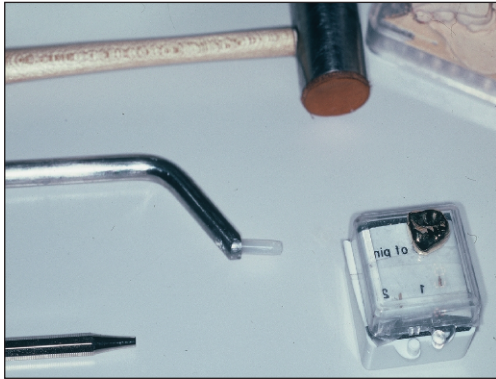


Figure 4. Armamentarium for seating crown; Mallet, offset seater, straight pin punch.

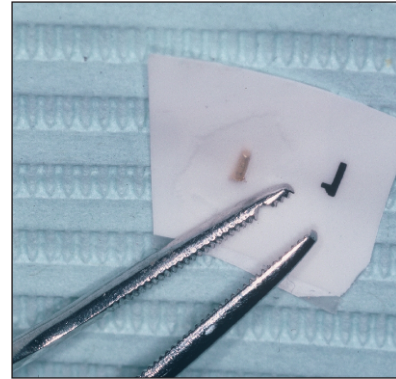


Figure 5. Altered cotton pliers, slot cut to facilitate pin placement.



Figure 6. Seating of vented crown, vibrate with mallet and offset seater until cement stops extruding from vent.

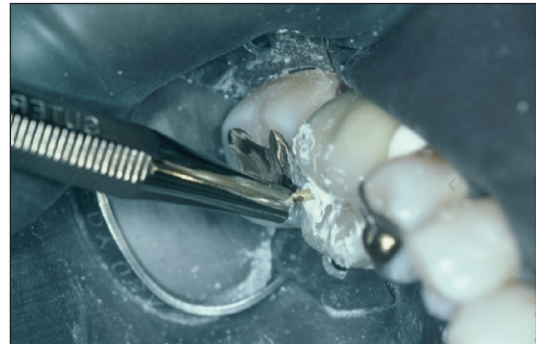


Figure 7. Pin tapped into hole with mallet and punch.



Figure 8. Final position view, pin has been polished to blend in with vent chimney.



Figure 9. Crown preparation with slot cut on buccal wall.

C. Insertion

4. The crown or coping is then cast as usual. JRVT gold can be used for the gold crown and Identalloy high noble alloy can be used for the coping (Figure 1).
 5. The pins are cast from #700 lab burnout pins (Figures 2 and 3). JRVT gold can be used to cast the pins.
1. Remove the provisional and clean the prep. Place the rubber dam, making sure the retainer does not interfere with seating of the crown.
 2. Choose a cement, mix and place it into the crown.
 3. Seat the crown and vibrate to ensure complete seating. Vibration is accomplished by using an offset seater and tapping with a leather-covered mallet. The excess cement is cleaned from the vent hole, and pressure/tapping with an offset seater is continued



Figure 10. PFM crown next to preparation.

until the excess cement stops extruding from the vent hole (Figures 4, 5 and 6).

4. Carefully place the pin in the hole and tap firmly into the vent hole (Figure 7).
5. Use a separating disc to cut the excess pin and polish the vent/pin area with garnet, fine sand and cuttle disks. Follow the discs with #4 pumice, 15 micron aluminum oxide and, finally, dry 1 micron aluminum oxide (Figure 8).
6. Remove the rubber dam and check the occlusion carefully.

II. Review of the Technique for an Internally-vented Crown

A. Preparation

1. Prepare the tooth as usual. Preparation of the margin design is your choice. Impress as you normally would.
2. Prior to placement of the provisional, cut a vertical slot onto the buccal or lingual wall of the preparation. The slot should extend to .5 mm–1 mm from the margin (Figure 9).

B. Laboratory

1. If the slot was cut after the impression, the laboratory technique is not altered. Fabricate the crown on die as usual, using a die spacer.
2. If the slot was cut before the impression, the slot can be blocked out on the die and the technician can fabricate the crown on the altered die (Figure 10).

C. Insertion

1. Insertion is the same as if no internal vent was present. Select a cement, fill the crown sparingly and seat.
2. Clean up the excess, especially at the location of the vent.

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