BACK -TO-BASICS

Model and Die
A Proper Beginning

Back-to-Basics *is a new series focused on basic skills necessary for a successful career in dental technology. For skilled professionals it will be a useful tool as a refresher for skills learned on the job – or long ago. For those new to dental technology, it will be an invaluable resource to keep on hand.*

This first article in the Back-to-Basics Series is an attempt to reinforce core skill training with an emphasis on the science behind the materials being used in the techniques shown. We begin our series with model and die, as it is so often overlooked. It is our hope everyone in the lab will benefit from this review.

Figure 1

Step 1. Condition Impression

To consistently achieve sharp margins and replicate necessary details without fuzziness it is imperative that you remove all blood, saliva and disinfectants. Any chemical left on the impression will react with the stone causing a soft model.

Rinse all impressions in a 2% potassium sulfate solution (2 Tbs potassium sulfate added to 1 gallon of distilled water) (**Figure 1**). This solution will also provide additional surface hardness to your model because the potassium sulfate acts as an accelerator when it comes in contact with the stone. *Caution: debubblizer will not work as a conditioner as it may contain lye that will act as a retardant and soften the surface of the stone.*

Figure 2

Step 2. Select the corresponding die stone for the impression material

Are high bites and tight contacts an issue in your laboratory? Could your die stone be the cause? The characteristics of impression materials have change significantly over the years. The industry standard now catalyzes the silicon base material with platinum instead of tin. All dental impression materials based on silicon (e.g. vinyl polysiloxane, polyethers, etc.) experience a reduction in shrinkage of about .05%. To insure perfect dimensional accuracy, you need a die stone that will provide a corresponding expansion of .05% (**Figure 2**). If you use common gypsum die stone, you will find a huge discrepancy in accuracy from the die in the lab to the tooth preparation done by the dentist.

Organic resins have been found to reduce and control gypsum's naturally high expansion. Organic chemicals (resins) that go from a liquid to a solid shrink; inorganic materials (gypsum) expand during the exothermic reaction. By fortifying gypsum with resin, we control the expansion in the working model.

Figure 3

Step 3. Pouring the model

Add your water first, and then add the powder, allowing it to settle into the water for absorption (**Figure 3**). This technique will minimize the amount of air incorporated into the mix during initial spatulation by hand.

Figure 4

Use a mechanical vacuum-mixing bowl (**Figure 4**). To achieve a dense cast, concurrently mix at 2 revolutions per second with a 60-second vacuum pull. *Caution: using a power investment mixer will cause over spatulation and weaken the stone.*

Figure 5

Step 4. Select pinning base stone

For optimum results, choose a pinning base stone that will provide 0% expansion (average expansion of lab stone is .08% - .1%) to eliminate stress around the dowel pins (**Figure 5**). The addition of resins in a pinning stone have virtually eliminated expansion. Why is this important? Have you ever heard a "snap" when separating dies that have been mounted with common lab stone? When the die model is cut and separated, the stress is relieved and the die model distorts.

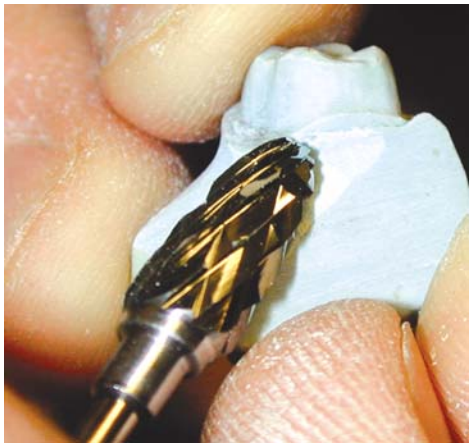

Figure 6

Step 5. Trim the die

To open dies, use a deep fluted, crosscut, pear shape carbide burr with ample vacuum and good lighting. The tip of the pear shape acts like a #8 bur and allows you to trim the margin and simultaneously reduce the surrounding tissue (**Figure 6**)

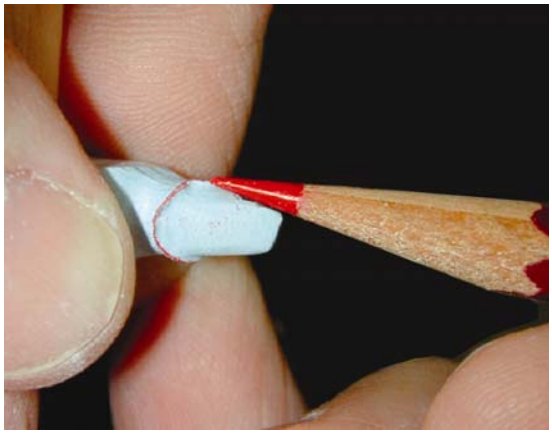

Figure 7

Step 6. Survey for undercuts

Do you waste time attempting to fit your copings to the die, and blame it on your investment? Slight undercuts that go virtually unseen prior to waxing can create huge problems. A great visual aid to help identify these undercuts is to roll the flat plane of a sharpened hard Red Wax Pencil around the die (**Figure 7**). The short time invested in this step will reduce your frustration and save time in production.

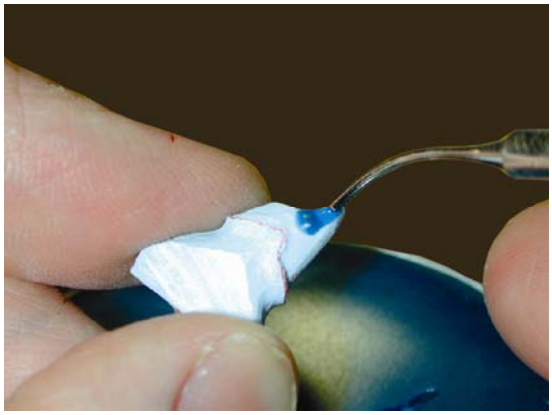

Figure 8

Step 7 Blockout undercuts

Once identified, it's easy to blockout the undercuts. The new blockout waxes have excellent adhesion, with the additional plus of great carvability, and a high melting temperature that won't distort when used with other waxes (**Figures 8 – 10**).

Cyanoacrylates (super glue) are messy, expensive and can lead to subtle undercuts during trimming.

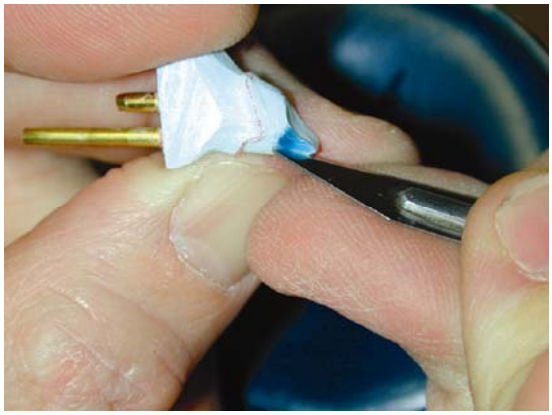

Figure 9

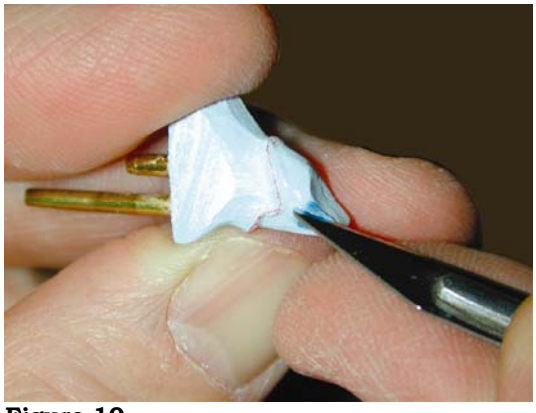

Figure 10

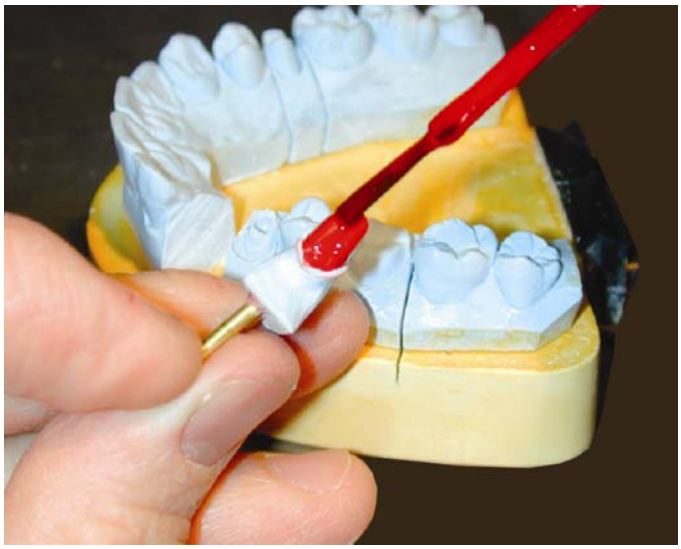

Figure 11

Step 8. Apply cement spacer

Look for a cement spacer that will provide the 28-micron thickness in 2 coats that most universities are recommending (**Figure 11**)

Figure 12

Step 9. Seal the die

The need to seal your dies becomes apparent once one understands the chemistry involved in the model process. An exothermic reaction occurs as your model sets. The water disappears, leaving a porous surface resembling honeycomb when viewed under a microscope. A die sealer both hardens and seals the die, preventing chipping and scratching of delicate margins and die spacer without creating additional thickness. Dip the die into the Die Sealer to just below the margins. Blot die with tissue or blow off the air hose to ensure an even coat. Allow sealer to dry for a few minutes (**Figure 12**).

Caution: Choose a cement spacer and sealer from the same manufacturer that has been scientifically formulated to work together to eliminate the possibility of chemical reaction between the two spirits.

The Authors

Mr. Edward J. Harms, CDT*, left, is CEO of Talladium, Inc., manufacturer and supplier to the dental laboratory industry. He is a graduate of Southern Illinois University with a BS in Physics and a minor in Metallurgy and Dental Technology. Mr. Harms has written articles and lectured globally on innovations in laboratory techniques and products.*

Mr. Edward R. Harms, CDT*, right, is Sr. Vice President of Operations at Talladium, Inc. and also a graduate of Southern Illinois University. "Eddie" conducts much of the research and development at Talladium and has lectured globally on innovations in laboratory techniques and products. For additional information, contact Talladium at (800) 221-6449 or www.talladium.com.*

(This article appeared in the "Journal of Dental Technology" March 2003 issue)