

## Dental Technology – A Method to Record Optimum Anterior Guidance for Restorative Dental Treatment

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An accurate anterior guidance is critical for optimal esthetics, phonetics, comfort, function, stress minimization, and longevity of teeth and restorations. This article describes a method for recording and transferring the anterior guidance information developed on provisional restorations. Felt tip pens were used to mark the static centric relation contacts and the functional disocclusive pathways established on the provisional restorations. A stone core was made intraorally over the lingual surfaces of the provisional restorations and the adjacent teeth. The water-soluble felt tip pen markings were transferred to the stone core and remarked with permanent felt tip inking. This becomes the anterior functional core, which is a precise blueprint for transferring all anterior guidance information.

When restoration or replacement of maxillary anterior teeth is necessary, developing the anterior guidance is one of the most important challenges for restorative dentists. An accurate anterior guidance is an essential factor for optimum esthetics, phonetics, a minimal-stress occlusion, functional efficiency, comfort, and maximum longevity of teeth and restoration. There are an infinite number of acceptable anterior guidances that depend on arch form relationships, habit patterns, periodontal support, and relative tooth positions. The optimum anterior guidance is a product of unrestricted mandibular movements in straight protrusive, lateral protrusive, and direct lateral pathways. Once the appropriate anterior guidance has been determined, it is then necessary to record and transfer this information accurately for precisely communicating laboratory instructions.

One popular way of recording the anterior guidance has been the use of an articulating instrument as a guide in fabricating the restorations and then finishing the restoration by grinding in the mouth. Dawson<sup>1</sup> in-

roduced the custom guide table concept, which added to the accuracy of anterior guidance recording. Fox et al.<sup>2</sup> described several methods for establishing anterior guidance. One of these methods involves the use of a silicone putty index over the unprepared anterior teeth on the diagnostic cast as a guide for finished restorations.

The process of developing an anterior guidance has four phases: (1) initial preparation of the overall existing occlusion, (2) Programming the required anterior guidance, (3) recording the anterior guidance, and (4) executing the necessary laboratory procedures. The literature contains ample information to address the first two phases of anterior guidance development, including Schuyler's classic article<sup>3</sup> on incisal guidance and Dawson's guidelines<sup>4</sup> for anterior guidance.

The purpose of this article is to present a precise method for recording and transferring anterior guidance called the anterior functional core.

### Procedure

A clinical situation is used to demonstrate this method. The treatment plan requires complete coverage restorations on four maxillary anterior teeth: a single crown on the right central incisor, a fixed partial denture from the left central incisor to the left canine, and replacement of the lateral incisor.

1. Eliminate all interferences to centric relation on the anterior and posterior teeth and eliminate all posterior functional interferences that prevent a full range of anterior guidance functional pathways.
2. Fabricate indirect acrylic resin provisional restorations and fit them on prepared teeth. Establish centric relation stops by marking contacts after manipulating the mandible into terminal hinge axis closure. Equilibrate provisional restorations until centric relation contacts are refined.
3. Allow for freedom in centric (long centric) relation.<sup>5</sup> Mark over established centric relation contacts with black Accufilm ribbon (Parkell, Farmingdale, N.Y.).



Figure 1 - Completed equilibration of provisionals with appropriate Accufilm markings of static centric relation contacts and functional pathways.



Figure 2 - Centric relation contacts marked with Accufilm ribbon are marked over with black water soluble felt tip pen.

With patient in an upright position, place red Accufilm ribbon between anterior teeth and ask the patient to lightly tap the back teeth. If the red mark is slightly incisal to the centric relation needs, grind from centric marks through red marks. (This rarely exceeds 0.5 mm)

4. Establish functional pathways in harmony with the envelope of function. While providing support for the mandible to maintain its equilibrium, guide the mandible in straight protrusive, lateral protrusive, and direct lateral movements. Develop the functional pathways on the mesial and distal marginal ridges instead of on the lingual body of the teeth. (This simplifies and expedites equilibration procedures while helping to maintain the natural tooth form on the lingual surfaces. The effect of the labial/incisal edges of the mandibular incisors functioning across the marginal ridges of the upper lingual surfaces is easy to develop, equilibrate, and maintain.)
5. Consider the optimum anterior guidance for this patient in accord with the particular esthetic and functional requirements that are indicated. Modify the provisional restorations by adding acrylic resin if necessary to develop functional pathways and static centric relation contacts. (Static centric relation contacts are provided on all six anterior teeth. Functional pathways are not usually indicated for the lateral incisors.)
6. Finish and polish the provisional restorations. Cement the provisional restorations with a noneugenol temporary cement (Kerr Mfg. Co., Romulus, Michigan) for easy removal within several days. Arrange a follow-up appointment for a few days after the restoration is cemented to verify the patient's comfort and satisfaction with the esthetics.
7. At the follow-up appointment, verify the accuracy of the occlusion. Mark the centric relation contacts and functional pathways on the provisional restorations with black and red Accufilm ribbon (Fig.1).
8. Remove the provisional restorations and mark the centric relation contacts and the functional pathways with a water soluble felt tip pen (Sanford Co., Bellwood, Illinois). Use two colors, one for centric relation contacts and the other for functional pathways (Fig. 2).
9. Place the provisional restorations back on the teeth. Make certain that they are seated and stay completely dry by keeping the teeth separated and isolated. Block any undercuts with Surgident Blue periphery wax (Surgident Co., Southbend, Indiana).
10. Make a mix of Snapstone stone (WhipMix Corp., Louisville, Kentucky) and load the index tray (Crown Enterprises, Oklahoma City, Oklahoma).

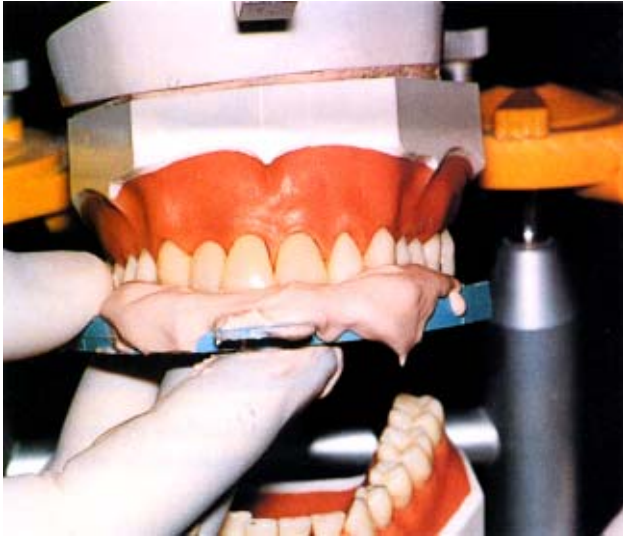


Figure 3 - Index tray, loaded with Snapstone mix, held in place for set (approximately 4 minutes).



Figure 4 - Water soluble markings are transferred to precise locations in core.

With index finger, take a small amount of Snapstone material and smear it over the occlusal surface of the premolars on one side, over the lingual surface of the provisional restorations, then around and over the occlusal surfaces of the opposite premolars (Fig. 3). (It is important to capture a minimum of two teeth on each side of the prepared teeth.) Immediately seat the loaded tray over the Snapstone material on the occlusal surfaces with a jiggling motion. Allow 4 minutes for the Snapstone material to set.

11. Remove the functional core. (The provisional restorations will come out with the core.) Carefully separate the provisional restorations from the core. (The inking on the set Snapstone material of the functional core (Fig. 4) is a precise copy of the inking on the provisional restorations.)
12. Immediately mark the water soluble inking on the functional core with two colors of permanent markers (Sharpie fine point permanent markers, Sanford Co., Bellwood, Illinois) to make the inking permanent. For example, mark centric relation contacts with black and pathways with red.
13. Trim away excess Snapstone material before it hardens. Trim away any stone that contacts tissue. Trial fit the functional core to the complete arch cast of the prepared teeth. Carefully trim the functional core until it can be perfectly positioned against the complete arch model (Fig. 5)
14. Mount the complete maxillary cast to the articulator with a face-bow. A simple two-dimensional instrument (Hanau H2, Hanau Co., Buffalo, New York) may be used. (The Ney Arctic-U-Lok system [NeyCo., Hartford, Connecticut] is used for both maxillary and mandibular anatomic casts and the functional core. This allows the maxillary working cast to be removed by the technician and the mandibular casts to be interchangeable.)
15. Mount the complete mandibular arch cast to the maxillary cast without a bite record (cast-to-cast). (This is accurate because the patient was equilibrated previously.) Use the layering method with the stone mounting to minimize distortion. When the stone is set, remove the mandibular anatomic cast. (The Artic-U-Lok system allows this to be managed simply and accurately.)
16. Position the core on the maxillary cast. Carefully trim away the core until it precisely fits. With the Artic-U-Lok system, secure the functional core to the maxillary cast with glue. Join the core with stone to the mandibular member of the articulator. Use the articulator to function only vertically against the functional core, and use the lateral ranges of function only when you wish to substitute the core with the anatomic model.
17. Seal the functional core with Tanaka stone sealer (Tanaka Co., Skokie, Illinois). (This is mandatory when ceramic restorations are made because it

allows the porcelain to retain necessary moisture during the build-up phase and also hardens the stone.) Paint Cerama Sep material (Belle de St. Claire, Chatsworth, California) over any part of the functional core that comes into contact with the porcelain buildup.

18. Begin the buildup with the various shoulder powders and dentin laminations. Proceed to the labial surface and continue with indicated inclusions and layering. Continue overbuilding until both labial and lingual surfaces are overbuilt approximately 10% to allow for porcelain shrinkage.
19. Carefully close the articulator against the core because the porcelain has not yet been fired (Fig. 6). The functional core will be slightly out of contact with the maxillary cast (approximately 1 mm). Complete the buildup and firing.
20. Seat the fired units on the maxillary solid cast (Fig. 7). Close the core against the crowns and check the occlusion. (The objective is contact on the



Figure 5 - Porcelain added to lingual surface of central incisor crown. Maxillary cast functions only vertically against core.

mesial and distal marginal ridges of the central incisors and mesial marginal ridge of the canine. There is no functional contact on the lateral incisor. There are static centric relation contacts on the central incisors, the lateral incisor, and the canine.)

21. Finish the laboratory procedures and try in the new crown (Fig. 8). Make any minor adjustments.

### Conclusion

This method of recording and transferring anterior guidance encourages the operator to develop all of the detailed requirements for individual anterior guidances regardless of any particular philosophy of occlusion. Whatever is developed in the provisional restorations will be faithfully recorded in the anterior functional core and will serve as a blueprint for the laboratory procedures. Patients often comment that the new restorations "feel so natural." The reason is the provisional and the final finished restorations are in the same position.



Figure 6 - Porcelain powder added to lingual surface of maxillary incisors. Core is carefully closed against slightly overbuilt porcelain. Only for visual purposes, locations of static centric contacts and functional pathways are marked with water soluble inking. This is not done in usual firing procedures.

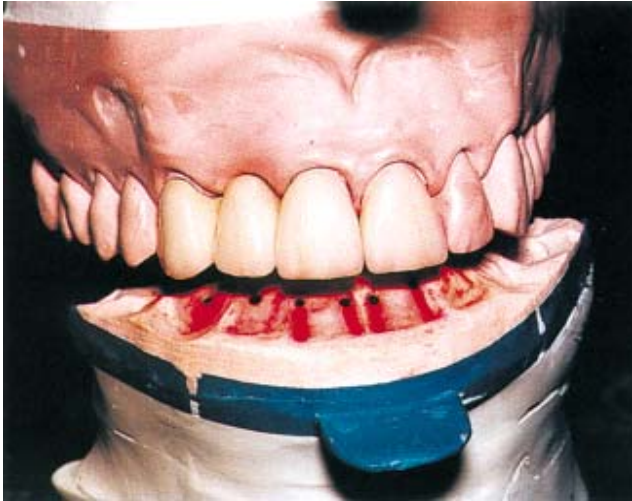


Figure 7 - Completed three-unit fixed partial denture and single crown on articulator against core.



Figure 8 - Completed and placed on manikin (patient). Static centric relation contacts and functional pathways marking precisely same as no the articulator with only slight adjustment required.

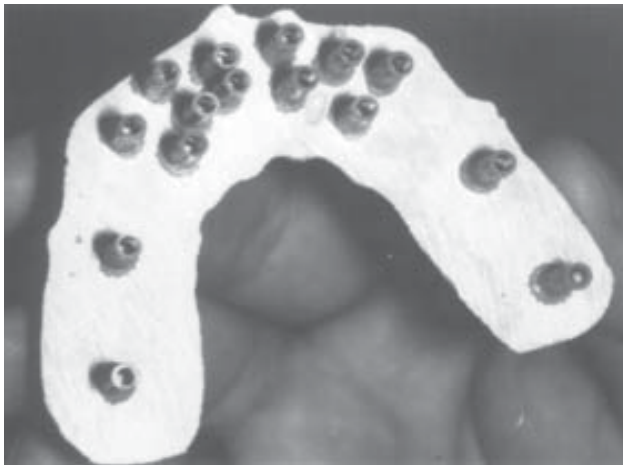
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## Master Casts An Evaluation of Various Die Systems

by Diego Oquendo

For all die systems, it is necessary to have two impressions of the tooth preparations. It is of utmost importance that your impressions be accurate in order for you to obtain optimum results. Retraction should be such that a submarginal margin of unprepared tooth structure can be seen on the dies once they have been



Base with pins & sleeves

poured. The models should be poured with a vacuum mixed die stone which will produce hard, bubble free casts. The interproximal contact points and occlusion



Trimmed Die

are finished on the solid model and transferred to the dies for final margination. In this article we will address the Non-pinned Die System, the Pindex System, and the DVA System.

### Non-Pinned Dies

Using the method, there are no pins to be inserted, nor a base in which to insert the dies. Prepare the dies for ease of working and trim them properly for accuracy. The dies should be trimmed with a flat base so



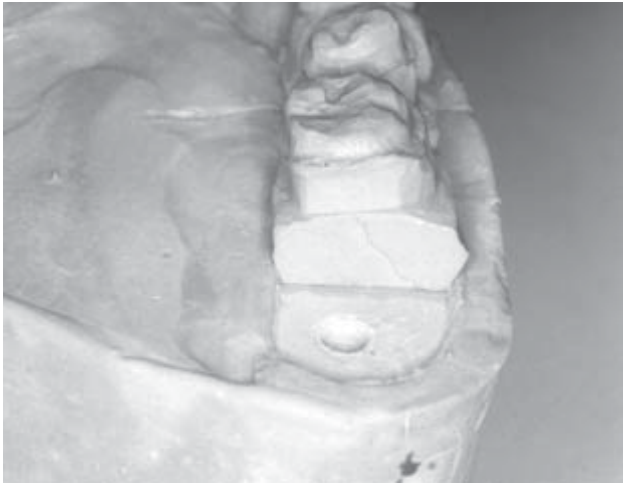
Dies separated with disc

that they can be stood up if necessary. One of the models will be cut at the interproximal tissue area of the teeth that have been prepared. This will enable you to work with each prepared die individually once you are ready to marginate.

\*Note: Marginating on the solid model is virtually impossible.

### Pindex System

With this system the impression is poured and the stone allowed to set before you even start to insert the pins. This system utilizes a paralleling technique that is very accurate when the dies need to be inserted or removed.



Model in Castone

Because this is a paralleling technique, there are no angles from one pin to the next, which would prevent a specific die from being removed without first removing another one.

After the model has set, holes are drilled in the bottom of the model. There will be two holes under each tooth preparation. These holes will all be parallel. A drop of cyanoacrylate is added to each pin, and the pin inserted into one of the drilled holes.

A single, tapered, flat-sided die pin can also be used. The pinned cast is boxed with wax and poured in a



Marking of the dots

hard stone. 1-2 mm of the pins should be exposed for easy removal of the dies. The base should overlap the walls of the dies about 2mm for additional anti-rotation stability.

The model is removed from the base and the dies are separated.

#### The DVA Model System

With this system the holes for the pins will be drilled in a plastic base before the impression is poured. This is also a paralleling technique.

The impression is trimmed and then boxed with a special material (DVA sealing silicone) which comes in the kit when the system is purchased. This same material is placed on the palate or lingual area.



Plates with pins are inserted into the positioning matrix

A blue plastic positioning matrix is then centered and sealed onto the impression with the sealing silicone which was used to box the impression.

The thin clear transfer disc is placed into the positioning matrix. Dots will be marked on this disc, with a water soluble marker, wherever pins are to be placed.

The clear transfer disc is then placed into the metal transfer frame along with a clear base plate. The dots will be transferred onto this base plate by looking perpendicular to the plates and marking them as seen on the transfer disc.

Once the base plate has been marked, the holes can be drilled with the drilling machine.

Plates with pins are inserted into the positioning matrix.

The pins are inserted into the base plate, the impression is then poured, and the base plate is placed over the impression in the positioning matrix.

After the stone has set, the model can be removed from the impression and the base plate separated from the model.



#8 bur trimming excess



Snapping of dies

The dies are now ready to be separated.

In all of these methods the dies are separated with an Econocutter (a disk for the lathe, made by Keystone). This is done by removing the model from the base (if a base is present), wetting the edge of the disk, and slowly starting to cut. Aim for the interproximal tissue area of the prepared teeth.

Tilt the model so the buccal side of the model is cut first. Once this is accomplished, tilt the model down so the disk will start to cut the lingual portion. Once the cut has been made (without cutting all the way through), apply pressure on the die to close the gap left by the disk. This will cause the model to snap without damaging the margins. Now trim your die (dies) in the following manner:

The tissue area should be rounded in order for the die to be turned between your fingers in any direction while in the process of waxing. The margin's edge should be left clear of any stone representing the tissue area. This is accomplished by removing the tissue in three steps.

1. Remove all the bulk of the tissue with a big pear shaped bur. This is where the rounding of the tissue area of the die takes place. Continue to trim the die until the desired thickness is reached.



Bulk being trimmed

- Using a #8 round bur, remove additional tissue so you can get closer to the margins. The tissue on the models should be far enough away from the margins so when they are trimmed with the round bur the tissue should flick off. You should not have to guess where the margins are. You should be able to see a sub-marginal apron on each of your preparations. A very small edge of tissue should be left at the margin so it can be trimmed under loupes or some other form of magnification. Under magnification, continue to trim with the #8 round bur.



Final trimming with Wedelstaedt chisel

- Using a Wedelstaedt chisel, give the margin a slight inward angulation, which will give your wax-up the proper contour. If the dies are to be used to fabricate a porcelain jacket crown, do not angulate the margin. This is to prevent the foil that is placed on the dies from spreading out at the margins as the foil is being removed.

In preparing the solid model, a gingivectomy must be performed on the model. This allows the margins to be seen with much greater precision, makes it possible to seat the wax-up on the model and check the wax-up to margin relationship.



Gingivectomy - A #700 bur is used to accomplish the gingivectomy. Remove a small amount of the tissue and margin at the same angle the dentist prepared the tooth. Try to expose the sulcus area while retaining as much of the tissue as possible.

*\*All of the systems mentioned here are very accurate ways of preparing dies for the wax-up or any other procedure where dies are required. When choosing your die system, it is best to utilize the system most comfortable for your staff and you.*