

# *Using provisionals to improve results in complex esthetic restorative cases*



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## **Abstract**

Provisionals (temporary restorations) provide more than an intermediate functional and protective covering device for teeth that have been prepared for an indirect restoration. They provide the opportunity to build a relationship with the patient, to more clearly achieve the patient's esthetic goals, to build patient hygiene skills and habits, and to learn what is ideal for patients occlusally, phonetically, and esthetically. This paper examines the benefits derived from spending more time in the provisional stage and how to communicate the most important information learned in this stage to the laboratory to be replicated in the final restorations.

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***Keywords: dental esthetics, provisionals, tooth tissue reduction guide, crown lengthening, envelope of function, phonetics, dental wax-up, treatment planning***

### ***Learning Objectives:***

This article demonstrates how provisionals can be used to build a collaborative relationship between the prosthodontist, patient, dental specialists, and laboratory. Provisionals can also be used to improve treatment outcomes. Upon reading this article, the reader should:

- Understand how to use provisionals to develop our patients and to build a clear understanding of treatment goals
- Understand how provisionals can be used to limit occlusal and phonetic problems that can occur in restorations.

### **The Role of Wax-Ups and Provisionals in Developing the Patient Relationship and Treatment Goals**

Building a successful esthetic restorative practice requires more than an ability to sell a case and prepare teeth well. The thriving dentist grows and differentiates his or her practice by building personal bonds with his or her client patients and working collaboratively with patients and dental specialists to create personalized esthetic treatment plans that are appropriate and different for each person.

In contemporary dentistry, some restorative dentists aspire to replicate natural beauty. Others aspire to fit restorations to a “media image” of teeth that are square, long and without chromatic variation. A one size fits all mentality will not satisfy the more sophisticated patients. Patients may not have the knowledge to describe natural beauty, but they know when they see it, and they appreciate the dentist allowing them to be involved during the workup and treatment stages.

An appropriate and personalized treatment plan requires diagnostic photographs of the patient (see selected example Figures 1, 2 and 3), radiographs, mounted models, and knowledge of the patient’s desires and expectations. These items should direct exploration of the treatment possibilities and options. Once a preliminary treatment direction is established, if the treatment has any complexity, the dentist should share and evaluate the initial records with “specialty practice consultants” to develop all parties’ understanding of the treatment options.



Figure 1. Right side pre-crown lengthening, pre-operative image



Figure 2. Full smile pre-operative and pre-crown lengthening image



Figure 3. Left side pre-crown lengthening, pre-operative image

Meetings with specialty practice consultants can be as simple as exchanging email images and following up with a phone call. There are occasions when the entire interdisciplinary team will need to meet to discuss the case together<sup>1</sup>. It is often of value to have done some additive or reductive waxing to the patient’s models prior to these meetings<sup>2</sup>.



Figure 4. Pre-operative model with tissue reduction guide given to surgeon indicating DDS-client agreed upon tissue heights

Involving specialists and the patient in the evolving treatment design creates ownership. If you help create it, you are more vested in the final result. For example, a patient is often effectively engaged in the treatment design when shown side view images of her gummy smile. The natural response of the patient is to ask about treatment options. This approach led the patient in this article's photos to decide how much and where to have crown lengthening (see Figure 4).



Figure 5. Mid-treatment image of patient taken after crown lengthening. Patient decides not to have orthodontics or more perio-plastic surgery even though it would improve esthetic results further.

Allowing the patient time to process the information learned from the workup and consultations will be valued by the patient. Bring the patient into the process by sharing what has been learned, ask your patient for their thoughts. With a better grasp of their own circumstances and treatment future, our patients usually make wise and personally appropriate decisions<sup>3</sup>. For example, by the time the patient had healed from gum surgery and was reevaluated as seen in Figure 5, she made the decision to not have orthodontics or more perio-plastic surgery even though it would further improve esthetic results.

If the issues in the case are complex, delaying final decisions is appropriate. Encouraging patients to become a student of smiles (for example, by encouraging them to cut out magazine pictures of smiles that they like (see Figure 6) and to bring in family pictures of themselves in youth) leads to discussion between the dentist and patient about face shapes, lip drapes, Angle's classifications, arch shapes, and other factors that affect how teeth appear in a smile<sup>4,5,6</sup>. This gives the patient a means to communicate desires and build



Figure 6. Magazine pictures of smiles offer a starting place for the interview/dialogue to determine the esthetic agenda of the patient.

understanding. During the time the patient is involved in learning about esthetics and discovering what she or he wants to achieve, the dentist is learning more about the patient and the patient's case, and the patient's ownership and engagement in the project is growing.

Once the patient and dental team's vision is clear, a wax-up of the plan should be created. This wax-up serves as the first rendering of the final product (Figure 7). All too often, in dentistry, the final restoration serves as the only rendering, especially in the case of implant restorations. This limits the lessons that a wax-up and provisionals can provide the dentist and patient that will improve the results.



Figure 7. Example of a wax-up. A wax-up is our interpretation of a patient's esthetic agenda and our technical plan to solve the occlusal and restorative issues

Although we are sometimes referred new patients that think, believe, imagine, assume, everything is possible, the majority of clients don't know what really is possible and even if they do, they don't know what the dentistry will look like in their own smile. Many practitioners have the ability to create digital images of potential outcomes<sup>7, 8</sup>. These images are helpful but can easily give patients unrealistic expectations due to the fact that morphing real teeth is far more difficult than doing it digitally. Applying composite "mock-ups" to the teeth also gives the patient an impression of how it could look, but this misses all the other learning that real provisionals provide<sup>9</sup>. It helps patients to both see and feel the planned dentistry in order to judge it. Wearing provisionals serves to develop their understanding of what is possible esthetically and offers patients opportunity for involvement in making modifications as the dentist tests how their dentistry will function, look, and feel.

### **Making Tooth Reduction Guides and Provisionals**

From the esthetic perspective, the wax-up is more than a means to solve the technical riddles and a guide for the laboratory to complete the project. The wax-

up is used in making reduction guides for tooth preparation<sup>10, 11,12</sup>. Because the wax-up is a rendering of your understanding of what the patient wants esthetically, it serves as the template for the provisionals, the second rendering of the final product. The wax-up can be used to fabricate the provisionals whether the dentist plans to make the provisionals directly in the mouth or indirectly in the lab.



Figure 8. Reduction guide made from a lab putty impression of the wax-up. This guide helps ensure appropriate tooth reduction to allow the laboratory to create more esthetic uniform thickness restorations. When used, no more tooth reduction than necessary is done.

The wax-up may be done by the restorative dentist, the laboratory technician who will eventually stack the porcelain, or a professional wax-up artist. The dentist must weigh the benefits of each choice. A technician who specializes in waxing may be more likely to create a beautiful wax rendering but there are significant learning moments that come by doing the wax-up yourself. For example, the dentist will get a better feel for just how much reduction needs to be done to move teeth into preferred orientations/positions, as well as for tissue/ridge contours and scallop heights<sup>11, 12</sup>. Cusp/fossae/ridge blade placement and functional issues also will become apparent to the dentist during the waxing process.

Once the wax-up is completed, reduction guides are prepared, and the patient is scheduled for preparation and provisionalization (see Figures 8, 9). Many patients require other preliminary treatments or specialty work, and the actual sequencing varies with each patient.



Figure 9. Methyl methacrylate veneer provisionals on anterior maxillary six teeth

## Planning phonetics, cosmetics, and occlusal determinates in provisional stage

No matter how well the contours, axial inclinations, and incisal edge positions are planned with pre-operative photos and wax-up, the dentist does not know what they will look like or how they will interact with the tissue to create scallop forms and inter-dental papillae until a provisional is placed into the mouth<sup>12, 13</sup>. Only with the provisionals in the mouth can the dentist determine how far from the margin the interproximal contacts should be placed<sup>13, 14</sup> and if the patient can clean with the new tooth contours.



Figure 10. Patient is left to live in her provisionals for 1-6 months prior to taking final impressions to evaluate and adapt to the modified esthetics, phonetics, function, and the tissue responses to surgery.

This also is the first time the patient sees and feels a model of the final restorations in the mouth. A new dialogue can take place between the dentist and patient about the esthetic interpretations the dentist made from previous conversations. The patient gets to see how the amended length, occlusal plane, and incisal embrasures of the teeth look behind the drape of her own lips (see Figure 10). It is rare that a patient doesn't have some modification in mind. Often these modifications are subtle, easy to perform, and pertain to embrasure shapes. Sometimes the patient's goal cannot be achieved. The dentist has the opportunity to explain why it cannot be done before it is sent to the laboratory instead of after the fact, which might sound like an excuse to the patient.

**Phonetic Concerns:** Whenever arch forms or the relationships between the linguals of the maxillary incisors to the incisal edges of the lower incisors are modified, the patient's ability to enunciate may change<sup>15, 16</sup>. Most difficulties are temporary because patients can adapt to a lot of changes. Lipping the S's can be a

more difficult dilemma because this frequently won't improve with time. S's are formed usually by forcing air between upper and lower incisors that are co-apted to within 1-2 mm of each other as the S sound is formed. The mandible moves anteriorly to different degrees depending on the Angle classification but, without the ability to limit the airflow between the upper and lower teeth, a lisp will occur.

Wearing provisionals allows for patient adaptation to changes in the phonetic interplay between the teeth and any occlusal changes that have been created by the prosthetic reorientation of teeth prior to the delivery of the final restorations. If the patient cannot adapt to the changes the practitioner has created, it is certainly good to know this and make the needed changes prior to sending the case to the lab.

**Esthetic Concerns:** Sometimes patients are startled by the quick and profound changes that can be made by doing dentistry. Provisionals allow a non-final intermediate place so that the patient can become accustomed to the changes. Occasionally a patient will express difficulty in getting used to the new look and express desire for less significant change. If the practitioner gives the patient time to "live" in the provisionals prior to taking final impressions, the patient has the opportunity to adjust and have more time to consider their decisions, often accepting the changes without additional modification. Having the patient wear the dentist's highly esthetic provisionals for an extended period also serves as a marketing device for the practice. Friends and family notice the improvements and assume the treatments are complete. This gives the patient the opportunity to say, "No, these are just temporaries," and describe the detailed, careful process underway to perfect the restorations for optimal comfort, function, and preferred appearance.

In the author's office, patient-requested modifications to the original provisionals are carved right in front of the patient. This allows the patient to appreciate the tremendous skill it takes to manifest their wishes in the plastic or composite provisionals. Making these modifications also solidifies the partnership between the dentist and patient, creating dual ownership and responsibility for the project. Willingness on behalf of the practitioner and later the technician, to follow the patient's wishes is a key factor in the ideal doctor-technician-patient relationship. Giving the patient permission and time to live with and think about



the modifications made to the provisionals can result in the patient asking to restore the original contours and in increased respect for the dentist's judgment.

**Occlusal Concerns:** The subtleties of mandibular guidance are often left undiscovered by even the most aware practitioners. As the mandible moves into excursive positions, the edges of the lower anterior teeth move against the guide planes of the upper teeth. In extended movements, the incisal edges of the lower anterior teeth function against the edges of the maxillary anterior teeth. Wear occurs in natural teeth on these edges, which creates flat facets rubbing against flat facets. In nature, these opposing facets will be parallel in 3 dimensions (see Figure 11). When reconstructing anterior teeth in porcelain, it is rare to find technicians and practitioners planning these functional surfaces in the final restorations (see Figure 12). Especially rare is the planning for the functional incisal edges past crossover of the cuspids.

Because of the hard and brittle nature of porcelain, as the patient rubs his/her edges together subsequent to prosthetic delivery, tooth wear, porcelain fracture, or de-bonding can result rather than what occurs in nature which is the



Figure 11. Cross-over wear facets on pre-operative cuspids



Figure 12. (Post operative view) The guide pathway and associated wear facet that developed in the patient accepted provisional was replicated in the final restoration

slow milling-in of these edges. The response of most practitioners is to demand softer, less abrasive porcelains that are more durable or to look for better glues to hold the porcelain in place. Successful, long-lasting restorations benefit from planning for these functional positions and not violating the patient's guidance patterns.

When forces are introduced into a system, there will always be some type of response. The normal response of aggressively rubbing teeth together over millions of cycles is tooth wear, breakage, mobility, movement, cold sensitivity, muscle soreness, and/or joint breakdown<sup>17-20</sup>. The natural response will be proportional to the forces generated by the patient. Simple physics teaches us that it takes more force to push something over a steep hill than a shallow gradient. It is important when restoring teeth not to steepen the gradients or guidance, or the forces in the system will increase as well as the likelihood of the above natural responses. Porcelain fracture is a very common manifestation of this response when restorations (especially maxillary laterals) are squared out in the smile design process. The porcelain is being placed "in the way" of normal border movements of their patients occlusal function. Making stronger restorations and glue only serves to shift the eventual natural response from the restoration to something else.

The same issues apply to posterior restorative dentistry. After designing the cusp fossae relationships and crow's foot guide pathways on the posterior occlusal surfaces of the provisionals, the dentist should consider confirming that the developing wear facets are small and round instead of streaks or comets<sup>21, 22</sup>. If wear facets shaped like comets or large scuffs appear on the provisionals, the molars are dragging against each other.

Modern practitioners construct provisionals out of many different materials with varying degrees of surface hardness. More information can be learned from the provisionals if they are constructed of a material that will show wear. Acrylic (methyl methacrylate) is an excellent material to use for the first set of provisionals due to its superior marginal fit, unsurpassed esthetics, non-brittle nature, and its ability to wear. This ability to slowly wear becomes extremely diagnostic because wear facets appear within days of delivery (see example Figure 13).

Wear facets will be shiny when lighted and they allow the practitioner the opportunity to see the individualized guide pathways that each patient habitually takes. Some facets will be very subtle even after months of wear. Others will be heavy and destructive to the provisional. Sometimes a multi-unit splinted provisional will repeatedly de-cement or fracture on one side or even on one tooth. Does the patient have a history of bruxism or of being hard on her or his teeth? Look at the non-restored teeth in the mouth; do they have heavy wear or mobility? If not, then it is probably your occlusal design that needs re-examination. This is strong evidence that the envelope of function has either been steepened in that area or the excursive transitions are bumpy. Occlusal rehabilitation should seek to recreate the patient's original envelope of function or to create one just a little shallower.

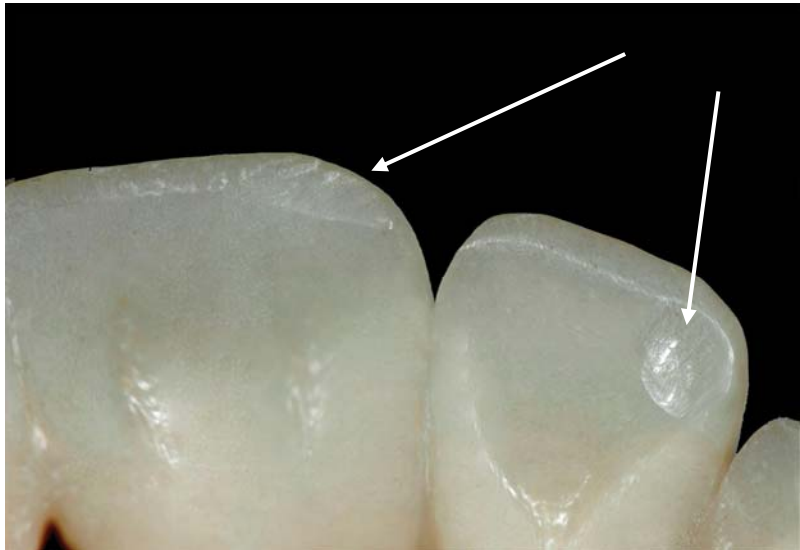


Figure 13. Example of wear facets that form on provisionals. They give the dentist-lab team clues as to how to design the contours and edges of the restorations.

**Lab Concerns:** When the provisionals have passed all the tests for esthetics, function, phonetics, and cleansability, then it is time to document them and send the case to the laboratory. If all criteria have been worked out in the provisional stage, then the lab only has to duplicate the contours of the provisionals to achieve an esthetic and comfortable result <sup>11, 23</sup> (see Figure 14). The dentist will help the technician achieve improved results by providing a critique of the provisionals from both the dentist's and patient's perspectives. The dentist should tell the technician how much artistic license the technician has in the duplication of the contours of the accepted provisionals.

## Conclusion

Laboratories are often requested to deliver lifelike restorations that esthetically and occlusally blend into the dentition without the information they need to provide these characteristics. Typically, there is little planning for provisionals done by the dentist prior to treatment and the provisionals usually are similar in shape and occlusion to the original teeth. This places too much responsibility on the lab technician and

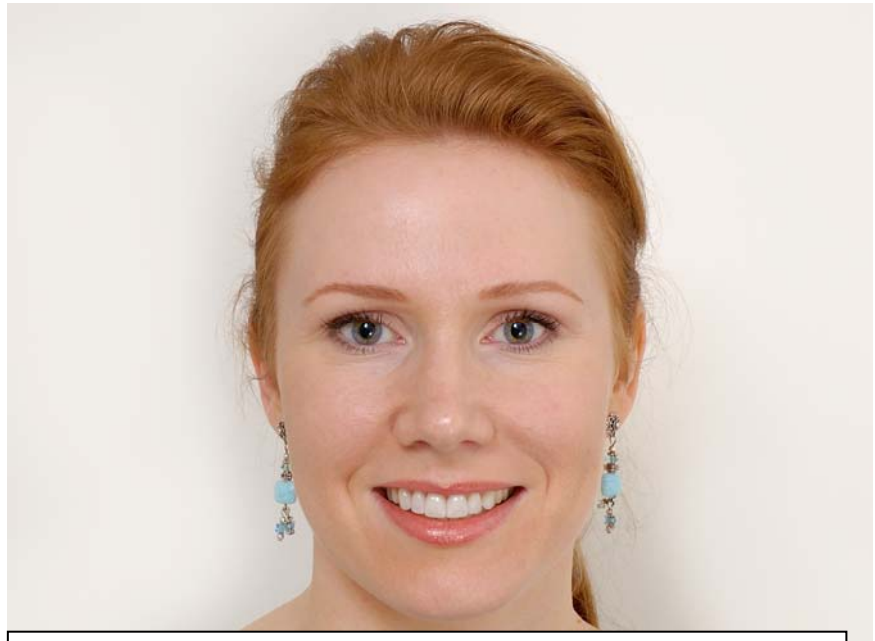


Figure 14. Post-operative image. The patient knows what the final restorations will look and feel like before they are placed.

takes most of the involvement away from the patient. By spending more time in the provisional stage, the dentist enjoys the opportunity to build a better relationship with the patient, to differentiate the dental practice and demonstrate the dentist's restorative skills, to build patient hygiene skills and habits, and to learn what is ideal for the patient occlusally and phonetically. The practitioner can address and confirm the patient's esthetic agenda, which increases patient satisfaction with the results.

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