Esthetic Templates for Complex Restorative Cases: Rationale and Management

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ABSTRACT

Complex restorative cases require difficult clinical decisions regarding the final esthetic outcome in which the operator must visualize the definitive restorative position of the teeth. These critical decisions need to be made before treatment is rendered. Communicating these decisions to the patient and the treatment team are crucial prior to achieving clinical success. The esthetic template is the conduit for providing excellent communication. The selection of the appropriate esthetic template is based on four sequential decisions: (1) dentofacial analysis, (2) blueprint development, (3) matrix management, and (4) template application. When utilizing an esthetic template, the clinician must know where the teeth should be placed based on a dentofacial analysis. The dentofacial analysis must then be communicated to the laboratory, and then a blueprint is developed from the diagnostic casts. A matrix is then fabricated from the blueprint and then related back to the existing dentition. The esthetic template is an invaluable communicator that can be utilized in office, with the patient at home, or even within the multidisciplinary treatment team. Clearly, the effective use of esthetic templates demonstrates a reversible way to visualize difficult esthetic decisions before any irreversible procedures are completed. Esthetic templates are a physical means of communication that provide the patient, technician, and multidisciplinary team an instrument to predictably manage complex restorative cases. The purpose of this article is to present a rationale for esthetic template selection and management of several techniques for complex restorative cases.

CLINICAL SIGNIFICANCE

Complex restorative cases require difficult clinical decisions regarding the final esthetic outcome in which the operator must visualize the definitive restorative position of the teeth. The use of an esthetic template commensurate with a rationale for selection enables the operator, patient, and entire interdisciplinary team to visualize the final esthetic outcome.

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INTRODUCTION

Dentistry continues to evolve with new techniques and materials; however, the success of treatment is based mainly on diagnosis and treatment planning.[1] Complex restorative cases require difficult clinical decisions regarding the final esthetic outcome in which the operator must visualize the definitive restorative position of the teeth. These critical

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decisions must be made before treatment is rendered. Communicating these decisions to the patient and the treatment team are crucial prior to achieving clinical success.[2] The esthetic template is the conduit for providing excellent communication.

Esthetic templates are not provisional restorations; the templates described in this article are preprovisionals that incorporate diagnostically driven matrices that transfer predicted tooth position before any irreversible procedures are performed. Confirming one's clinical impression in the diagnostic phase reduces the risk for problems during the course of treatment. The goals of esthetic templates are (1) patient visualization, (2) laboratory communication, and (3) clinician verification. These templates allow the patient to visualize predicted treatment outcomes directly in the mouth. Moreover, the esthetic template can be utilized to communicate key esthetic information to the dental technician. Traditionally, in removable prosthodontics, a wax rim has been used to evaluate prospective tooth position and maxillary plane orientation.[3] By creating an esthetic template for fixed prosthodontic cases, the clinician can verify the final tooth position before any irreversible procedures are performed. In essence, this is the wax rim concept applied to dentate patients.

Various esthetic diagnostic techniques have been described in the literature, such as direct composite resin mock-ups, the use of indelible pen, computerized dental imaging, intraoral tooth reshaping, and denture teeth setup. Gurel described a "preevaluative temporary technique," which enables the clinician and patient to visualize the definitive outcome. Once the esthetic goals are confirmed, the dentist can start preparing the teeth through the preevaluative provisional, which has been bonded to the teeth, utilizing it as a tooth reduction guide.[4] Presently, one technique that facilitates esthetic diagnostics for complex clinical scenarios has not been described in the literature. Moreover, a rationale for appropriate indications is still needed. Understanding which type of template works well and where it works is critical to which esthetic template the clinician chooses. The selection of the appropriate esthetic template is based on four sequential decisions: (1) dentofacial analysis, (2) blueprint development, (3) matrix management, and (4) template application.

The purpose of this article is to present a rationale for esthetic template selection and management of several techniques for complex restorative cases.

1. DENTOFACIAL ANALYSIS

In order to select the proper template, the most important question to answer is where the teeth belong in the face (Figure 1). Based on the clinician's dentofacial analysis, tooth position can be described in three planes of space: vertical, horizontal, and sagittal. The vertical plane of space allows the visualization of the incisal edge length, proposed gingival location, and relative position of the maxillary occlusal plane (Figure 2A,B).[5] The horizontal plane allows the clinician to visualize the anterior and posterior position of the incisal edge (Figure 3). The sagittal plane comprises the dental midline and the mesial and distal position of the teeth. Typically, the clinician combines movements in these planes of space in order to visualize the final tooth position. Once the desired position of the teeth has been verified, the clinician must decide whether laboratory support is needed.

If minimal alteration is indicated, the clinician may choose between the direct composite resin mock-up technique, dental imaging, masking of selected areas of the teeth with an indelible black marker, or removal of tooth structure. Minimal alterations are performed in cases such as mild attrition, mild erosion, peg laterals, or diastemata. The direct composite resin mock-up technique is highly

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esthetic and an excellent patient and laboratory communicator, thus allowing for an accurate representation of the proposed treatment (Figure 4A–C).[6] However, this technique requires longer chair time, is technically demanding, and is best suited for anterior esthetic cases.

Figure 1. Full preoperative facial view allows the clinician to perform a dentofacial analysis.

Dental imaging can be effective for visualization; however, a two-dimensional picture of a three-dimensional object does not provide critical three-dimensional information. The technique of masking selected areas of the teeth with an indelible black marker requires minimal chair time and is easy to perform but is restricted to shortening teeth. Recontouring teeth with a bur is also relatively simple to perform; however, it is an irreversible procedure.

Extensive alterations are performed in cases such as moderate-severe attrition and erosion, modifications in contour and position, missing teeth, and orthodontic movement. Often, this type of alteration is outside the clinicians' comfort level and overly time consuming to perform chairside. If extensive alteration is indicated, then laboratory support is utilized to create a blueprint, which is the envisioned

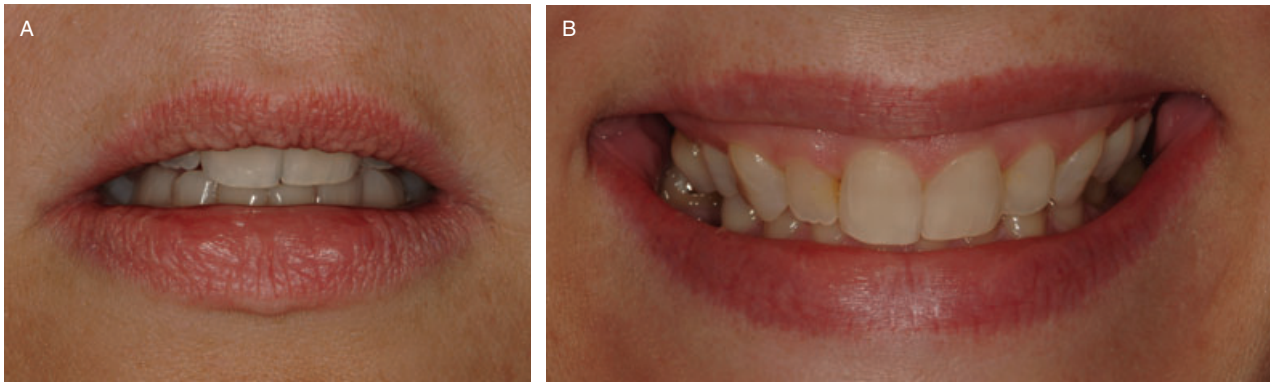

Figure 2. A *and* B*, Frontal view of lips at rest position and high smile are used to visualize the definitive tooth position in the vertical plane.*

Figure 3. Lateral view of smile is used to visualize tooth position in the horizontal plane. Note the current position is retroclined compared with the desired position.

comprehensive plan based on the dentofacial analysis, on the diagnostic cast.

2. BLUEPRINT DEVELOPMENT

A diagnostic wax-up is created based on the clinician's dentofacial analysis and esthetic judgment commensurate with the patient's vision. Some restorative cases require a multidisciplinary approach with the involvement of various specialties.[7] More specifically, orthodontics necessitates some form of setup for treatment visualization. This information can be transferred to the laboratory technician, who can now develop the blueprint. Before moving ahead, it is important for the clinician to analyze the blueprint upon return from the laboratory and ensure that it satisfies the esthetic vision.

After the analysis, the clinician must decide whether the blueprint is additive or subtractive. Some alterations are more predictable than others when utilizing esthetic templates. Movement of teeth apically and posteriorly is more difficult, if not impossible, to perform. These movements are considered subtractive procedures, which include shortening teeth, narrowing teeth, and moving teeth lingually. This type of movement has limitations because the teeth are usually in the way. Masking or recontouring teeth can shorten them as described; however, moving teeth lingually is impossible to achieve with an esthetic template. If the treatment plan incorporates lingual movement, then the best way to communicate with the patient is the blueprint itself. As opposed to moving teeth apically and posteriorly, moving teeth incisally and anteriorly is predictable, and there are many ways to accomplish this outcome. These movements are considered additive procedures, which include lengthening teeth, widening teeth, moving teeth facially, and replacing missing teeth. Once the clinician knows that the alteration is additive, he or she is ready to create the matrix.

3. MATRIX MANAGEMENT

As soon as the clinician has determined that the blueprint is additive, the next step is to create a matrix and transfer the blueprint to the mouth. At this point, the clinician knows the blueprint and needs to relate the matrix back to the existing dentition. In most cases, transferring the blueprint to the mouth is accomplished with a matrix fabricated off the diagnostic wax-up/setup. These matrices can be fabricated off the cast using two distinctive approaches: a vacuum-formed template or a direct impression with either silicone putty or irreversible hydrocolloid as matrix material. These materials essentially

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Figure 4. A, *Initial image prior to the application of direct composite resin mock-up. Note no tooth display at rest position.* B, *Application of a direct composite resin mock-up (can be performed freehand or with a palatal matrix).* C, *Completed direct composite resin mock-up.*

duplicate the blueprint and create a vehicle for its transfer to the mouth. The matrix is then filled with a provisional material, approximated over the existing dentition, and allowed to cure. This technique allows a simple, low-cost way to verify planned tooth position in an esthetic way.

With some treatment strategies, the blueprint matrix cannot be approximated over the existing dentition because extensive anterior or sagittal movement was treatment planned. Therefore, a technique that uses a reference point other than the teeth must be utilized. The most stable reference point to use is the palate when the teeth are undergoing orthodontic movement. Typically, when using the palate as a reference point, everything lingual to the incisal edge is removed from the template, allowing it to be properly oriented. This matrix is then filled with a provisional material and approximated over the diagnostic cast using an indirect technique (Figure 5A–D).

Once the clinician has made the choice of which template technique to utilize, the last decision to make

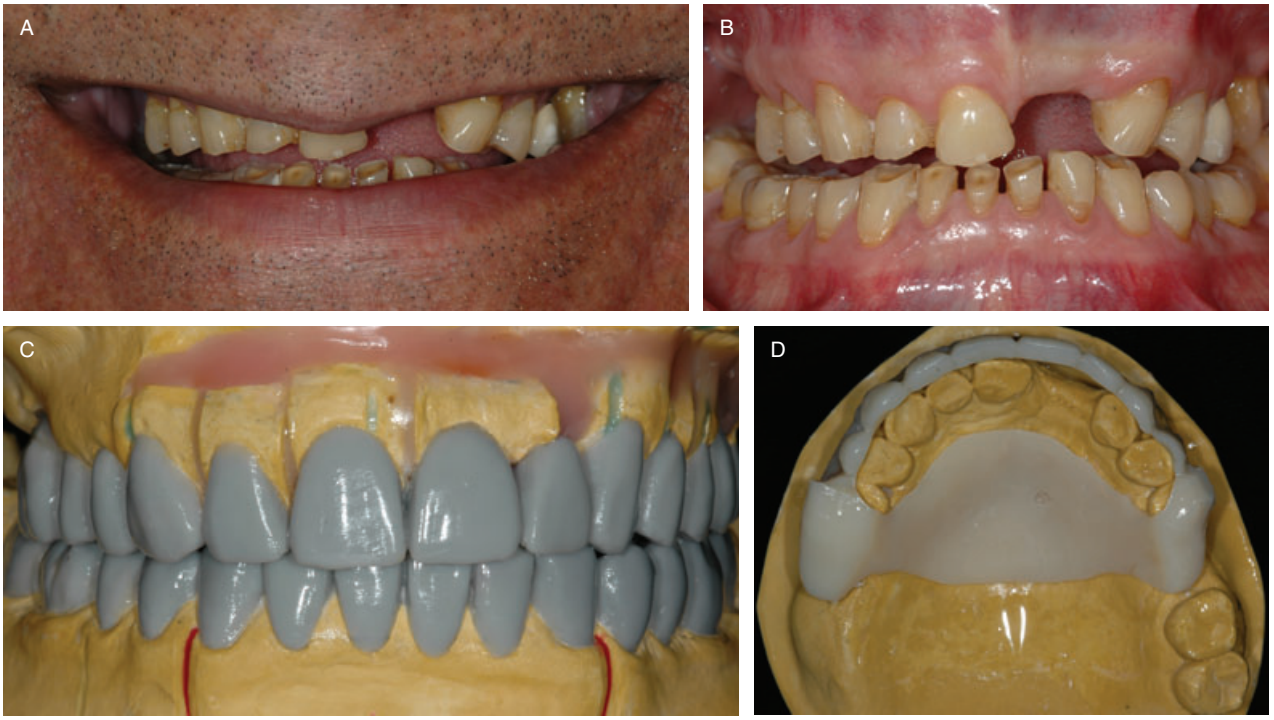

Figure 5. A, *A frontal preoperative smile of a patient requiring a comprehensive multidisciplinary treatment. An indirect technique will be used to simulate the prospective teeth position.* B, *A frontal preoperative view.* C, *A blueprint is created on the mounted diagnostic casts using a combination of orthodontic setup and diagnostic wax-up.* D, *Completed indirect removable template position on the diagnostic cast. Note the extensive alterations planned.*

is which material to select for the esthetic template. One of two choices can be applied for esthetic template management. These materials consist of polymethyl methacrylate acrylic (PMMA) and composite resin (bis-GMA, Protemp 3, Garant, 3M ESPE, St. Paul, MN, USA). Both of these materials provide excellent esthetics, color, detail reproduction, and are relatively easy to use.

A key factor in which of these two materials to choose is whether this template should be removable or fixed. If the template needs to be easily removed, then PMMA should be the material of choice because the clinician can remove it during polymerization to establish a path of draw. Large gingival embrasures can pose a risk for locking the template onto the teeth; wax or any blockout material should be considered. If the template does not need to be removed, bis-GMA is typically considered. These templates can then be bonded to the teeth and worn as trial restorations or used as preparation guides for actual tooth preparation (Figure 6A–C).

4. TEMPLATE APPLICATION

Esthetic templates possess a multitude of applications. The primary use of these templates in office is to facilitate clinician/patient communication. Allowing the patient to visualize the anticipated treatment result can align the clinician/patient esthetic vision while confirming the clinician's clinical impression. Typically, patients will have some esthetic changes or affirmations about the template. The template promotes a dialogue between the clinician and patient that possesses a much higher value than trying to explain the

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Figure 6. A, *Initial smile prior to using a fixed template.* B, *A blueprint was created with the diagnostic wax-up.* C, *Completed fixed bis-GMA template in the patient's mouth during smile.*

treatment goals on a mounted set of diagnostic casts. The patient essentially wears the final result before any irreversible procedures begin. If esthetic modifications are necessary to the matrix, then these changes are communicated to the dental technician, allowing the blueprint to be modified before treatment ever commences.

These templates can be designed as removable appliances and given to the patient to take home. With complex restorative cases, the alterations are usually significant. Treatment discussions can be very overwhelming for some patients; the template allows the patient an opportunity to take his/her time while retaining a visualization tool. At home, opinions of friends and family can aid in the patient's decision process.

Prerestorative template management facilitates multidisciplinary communication. The esthetic template enables the entire treatment team to visualize the definitive treatment outcome in the patient's mouth in their own respective practices. Esthetic templates can be used to communicate periodontal protocols, such as crown lengthening, implant position, and mucogingival procedures. Visualization of predicted esthetic outcomes is not easily managed when teeth are not in the ideal position and their shape and contour are not optimal. As with many multidisciplinary cases, tooth provisionalization cannot always be performed prior to orthodontic procedures, and the

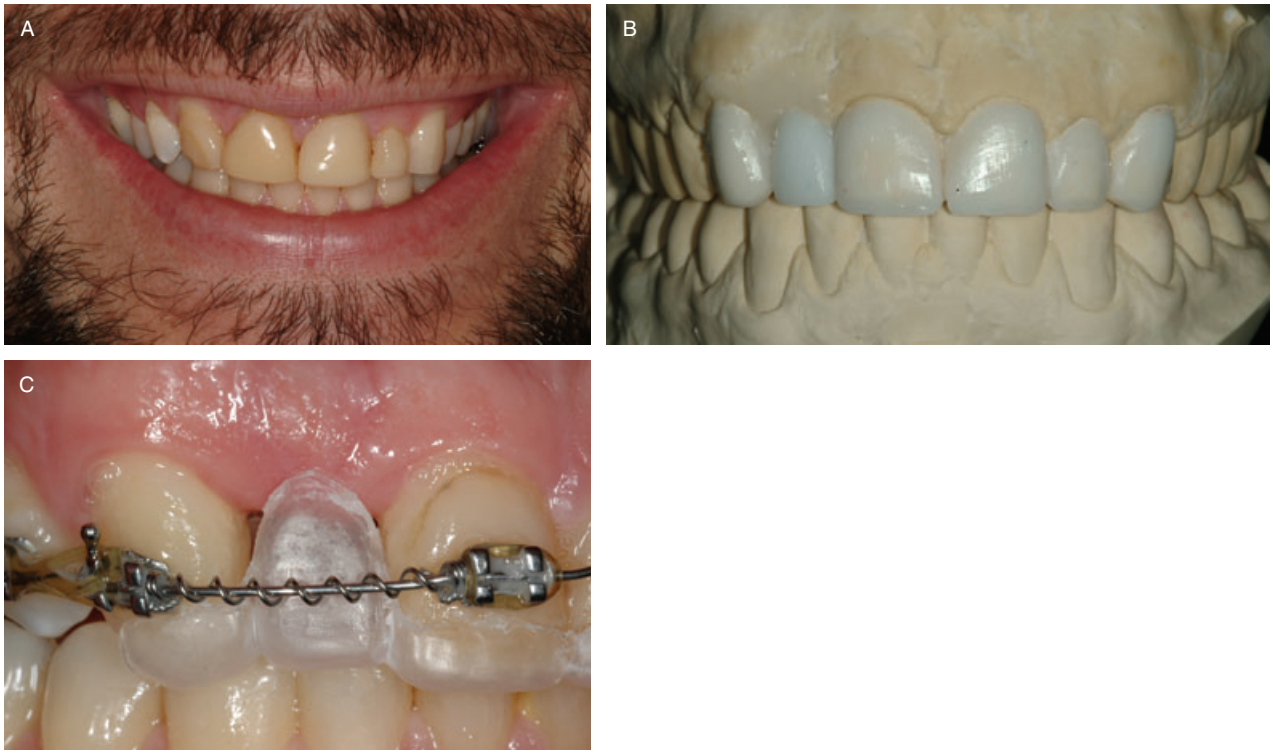

Figure 7. A, *Preoperative smile prior to orthodontic movement.* B, *Blueprint was created with orthodontic setup and diagnostic wax-up.* C, *Completed vacuum-formed matrix to verify orthodontic space appropriation.*

Figure 8. Silicone putty matrix was generated from the blueprint to guide orthodontic treatment of the canine, utilizing the palate as a reference. Note that additional mesial and apical movement of the cuspid is required to approximate the matrix.

esthetic template allows an orthodontist to utilize the blueprint in the mouth as well (Figures 7A–C and 8). Another application is using the matrix from the blueprint to verify proper tooth alignment or even movement progression. This technique is more predictable than traditional methods of measurement off the diagnostic wax-up and arbitrary relation back to the patient's mouth. Understanding the rationale and management of esthetic templates allows the clinician to apply the template not only in the diagnostic phase but also during various stages of treatment.

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Figure 9. Step 1: dentofacial analysis—preoperative view of the patient's smile.

Figure 10. Step 2: blueprint development—diagnostic wax-up.

Figure 11. Step 3: matrix management—vacuum-formed matrix prior to filling up with polymethyl methacrylate acrylic.

Figure 12. Step 4: template application—polymethyl methacrylate acrylic template after vacuum-formed matrix removal.

SUMMARY

In summary, a diagnostic rationale for esthetic template fabrication and management has been presented. Four sequential decisions that a clinician must contemplate were discussed (Figures 9–12). When utilizing an esthetic template, the clinician must know where he or she wants to put the teeth based on a dentofacial analysis. The dentofacial analysis must then be communicated to the laboratory and then a blueprint is developed from the diagnostic casts. A matrix is then fabricated from the blueprint and then related back to the existing dentition. The esthetic template is an invaluable communicator that can be utilized in office, with the patient at home, or even within the multidisciplinary treatment team. Clearly, the effective use of esthetic templates demonstrates a reversible way to visualize difficult esthetic decisions before any irreversible procedures are completed. Esthetic templates are a physical means of communication that provide the patient, technician, and multidisciplinary team with an instrument to predictably manage complex restorative cases.

DISCLOSURE

The authors do not have any financial interest in the companies

whose materials are included in this article.

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