Integrating Facial Symmetry and Functional Balance in Wax-Up for Optimal Aesthetics

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Abstract

In this case report, the application of complete esthetic and function-centric diagnostic approach employing the wax up approach for anterior and full arch rehabilitation is described. The wax-up served as a crucial diagnostic tool, facilitating fine adjustments and helping to prevent or correct potential clinical issues that could emerge during the restoration process. Thus, when the bipupillary line, the bicommissural line and the facial midline were connected to each other the final restorations both provided esthetic balance and biological compatibility. Lithium disilicate proved to be a durable material and aesthetically pleasing, both of which will enhance the patient's satisfaction. This case is a good example of the use of wax-up in complex dental rehabilitations and reinforces the understanding as to how effective this technique can be in providing consistency in treatment delivery and the aesthetic outcomes.

Keywords: wax-up, esthetic evaluation, dental restoration

INTRODUCTION

By aesthetic evaluation, aesthetic analysis needs to take its proper place during the first phase of the dental rehabilitation at any clinic, especially using wax-up techniques since they are essential in both aesthetic and functional treatments in prosthetic care. Wax-up is no longer just a diagnostic tool in modern dental esthetic rehabilitation, but it is a map that outlines the whole treatment plan for the optimal accomplishment of both the patient's expectation and the clinician's standard [1]. Thus, wax-up is of great importance since it allows showing all the prospective alterations of the case in three dimensions, and, thus, it helps in the accurate planning of the position and shape of preparations and restoration in the mouth [2]. The evaluation of esthetics during the wax-up helps anticipate potential issues with tooth positioning, symmetry, balance of the newly formed dentition, and overall facial proportions [3]. Such identification is done before the beginning of a treatment plan, which means that it is easier to make corrections during the initial stage in order to improve the final result. In addition, by taking into account functional factors like, occlusion and bite forces, the wax-up guarantees that the final prosthesis is both esthetically acceptable and biomechanically sound [4]. However, such advantages are not without some drawbacks that are associated with the wax-up technique as shown below. One such area of concern however is the ability to achieve a perfect representation of the final design from the wax up model especially when working with difficult cases that require much alteration. As with the overbuild-up, thick wax-ups may hide vital features and affect the accuracy of tooth preparations and, therefore, it might be counterproductive [5]. The processes of formation of the model and the elimination of too many details that could be interfering with the clinical procedure, has to be managed well and has to be very cautiously carried out [6]. Over the years, technology has enhanced new approaches in carrying out dental treatments such that wax-up is not the only method that is used but it is more accurate. For example, computer generated wax-ups let the practitioner make changes as some instances in order to give out the desired aesthetics and planning which can be a better dynamic approach [7]. Such advancements demonstrate the gradual shift of the direction of aesthetic and functional rehabilitation in dentistry as classical methods are being developed and expanded upon through the use of digital technologies [8]. The present study seeks to assess the utilisation of aesthetic analysis in wax up of prosthetic rehabilitation. This study aims to demonstrate how wax-up models can enhance the likelihood of successful dental restorations by illustrating the close relationship between the aesthetic and functional aspects of the restoration process. Furthermore, the study will discuss shortcomings of current wax-up techniques and ways to increase the effectiveness of these maneuvers which will potentially advance the clinical practice in the field of restorative dentistry [9].

MATERIAL AND METHODS

This case report describes the aesthetic and functional rehabilitation of a 34-year-old female patient through a comprehensive treatment plan supported by detailed wax-up analysis. The primary objective was to enhance the aesthetics and quality of her dentition, with the wax-up serving as a planning tool to achieve this goal effectively. During the initial consultation, a thorough facial and dental evaluation was conducted to identify key parameters related to both beauty and function. These included the bipupillary line to check the symmetry of the upper dental arch and reference lines such as the bicommissural line and the facial midline to ensure correct positioning of dental and facial structures. Additionally, facial thirds—upper (trichion to ophrion), middle (ophrion to subnasale), and lower

(subnasale to gnathion)—were assessed as part of the analysis to ensure proper integration of dental restorations with the patient's facial features.

The wax-up was designed to meet the patient's aesthetic expectations, focusing on the position of the incisal edges of the maxillary incisors, the alignment of the occlusal plane with the commissural line, and the placement of the smile line. The buccal corridor's aesthetic appearance was also evaluated, alongside precise positioning of the dental midline, all of which contributed to optimizing both the aesthetic and functional outcomes. In the functional assessment, the wax-up was used to replicate the occlusal relationship, including overbite and overjet measurements, while also estimating the nasolabial angle and E-line according to standard facial analysis. Phonetic analysis was performed to establish the correct position of the incisal edges and to assess anterior teeth visibility while speaking (Figure 2b). Additionally, the vertical dimension of occlusion was studied to ensure adequate room for mastication, swallowing, and speech. The wax-up provided a framework for designing the shape and structure of the teeth to be prepared, ensuring that the final restorations would not only look natural but also function effectively. The dental preparations were carried out according to the form and dimensions established in the wax-up, with particular attention to preserving the enamel surface and avoiding excessive tooth reduction.

For the final restorations, lithium disilicate was selected as the material due to its excellent mechanical properties and aesthetic qualities, closely resembling human enamel. The material used was e.max® lithium disilicate (Ivoclar Vivadent, Schaan, Liechtenstein). The preparation surfaces were etched with 37% phosphoric acid (Ultra-Etch, Ultradent Products, South Jordan, USA) to improve bonding, and the internal surfaces of the restorations were treated with a silane coupling agent (Monobond Plus, Ivoclar Vivadent, Schaan, Liechtenstein) to ensure a strong chemical bond to the resin cement. The final restorations were fixed using Variolink Esthetic Light Cure resin cement (Ivoclar Vivadent, Schaan, Liechtenstein), known for its excellent adhesive properties and compatibility with lithium disilicate.

The final restorations were evaluated for both aesthetic and functional outcomes. Of particular importance was the patient's satisfaction with the aesthetic results, as well as the functional coherence of the restorations. The fit and occlusion were thoroughly assessed, ensuring that the restorations complemented the patient's facial features and occlusal dynamics. No prosthetic complications were encountered during the postoperative phase, and the restorations showed remarkable resistance to wear throughout the monitoring period. This case highlights the importance of integrating wax-up analysis into complex dental rehabilitations to achieve both aesthetic and functional goals. The wax-up not only facilitated the preparation and restoration phases but also ensured that the final outcomes met the patient's expectations.

RESULTS

The wax-up technique employed in this case proved to be an invaluable tool, guiding the treatment planning process by aligning both aesthetic and functional goals. It played a central role in avoiding common missteps often seen in complex full-mouth rehabilitations, especially in maintaining a balance between occlusal function and esthetic enhancement. The wax-up effectively facilitated the alignment of dental structures with key facial reference lines, ensuring that the final restorations harmonized with the patient's natural facial features. This careful alignment of the bipupillary and bicommissural lines was essential in establishing a correct midline, contributing to an aesthetically pleasing smile. One of the critical successes of the wax-up was in positioning the maxillary central incisors. Achieving the correct positioning of the incisal edges not only fulfilled the patient's aesthetic goals but

also improved phonetic characteristics, further enhancing the overall outcome. The wax-up allowed for precise determination of the vertical dimension of occlusion, contributing to a natural and comfortable appearance of the patient's dentition.

From a functional standpoint, the wax-up was instrumental in defining essential occlusal parameters, such as the overbite and overjet, which are crucial for the long-term stability and comfort of the restoration. In addition, the positioning of the teeth in relation to the nasolabial angle and the E-line were optimized, contributing to the functional success of the treatment. The process also helped minimize potential errors during the tooth preparation stage, preserving valuable tooth structure, which is particularly important when working on anterior restorations or full-arch rehabilitations. By providing a detailed visualization of the final restorations, the wax-up allowed for adjustments during the preparation stage, ensuring that the final restorations would fit perfectly while maintaining both functional and aesthetic integrity. In summary, the use of the wax-up was critical to the successful outcome of this rehabilitation. The technique not only helped in achieving the desired esthetic and functional results but also reduced the likelihood of errors during the clinical procedure, increasing the overall precision and patient satisfaction. The positive outcomes from this case reinforce the importance of a comprehensive approach in treatment planning, particularly in complex anterior or full-arch rehabilitations, where both aesthetics and function are essential.

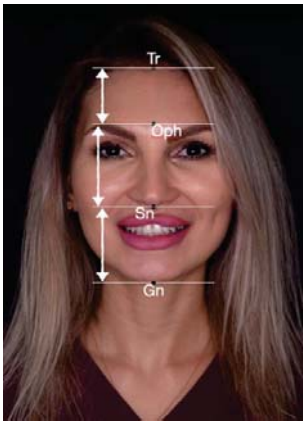

Figure 1. A facial analysis considering the three segments of the face divides the face into three horizontal thirds

(a)

Figure 2a. Dentolabial analysis of the patient

(b)

Figure 2b. Phonetic Analysis

Figure 3. Gingival and Dental Analysis

Figure 4a. Extraoral Gingival Analysis

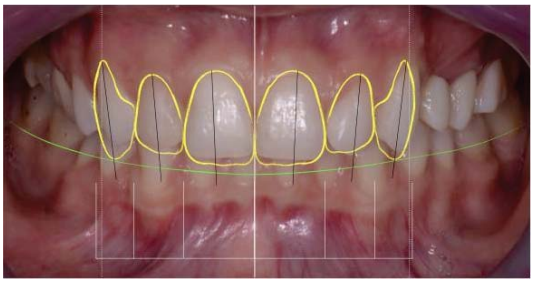

Figure 4b. Intraoral Gingival Analysis

Figure 5. Analysis of the Wax-Up on the Study Model: Evaluation of Esthetic and Functional Integration for Optimal Restorative Outcomes

DISCUSSIONS

The outcomes of this case shed the light on the substantial benefits of integrating an architectural aesthetic and functional analysis through the wax-up methodology in dental rehabilitation especially when dealing with more involved cases around the esthetic zone or total arch replacement. Waxing up actually helped to set the parameters of the treatment plan that had to be followed in order to achieve the needed esthetic changes as well as being predictable when functional changes are expected. Another informative conclusion that can be drawn from this case is that wax- up models are indispensable, while attempting the various errors are likely to occur in the restorative process. The ability to give a detailed visualization of the final outcome in a wax-up was useful in minimizing further adjustments in the course of tooth preparation. This approach was especially helpful in the anterior area because even a slight deviation from the midline, the mirror image or position of the incisal edges, holds potential to cause a cosmetically adverse effect [10,11]. In addition, the wax-up enabled a proper assessment and understanding of the patient's facial and dental morphology to ensure that the restorations complement his features. The careful positioning of the bipupillary line, bicommissural line, and facial midline guaranteed that the final proportions of restorative treatments were esthetically attractive and conformative to the patient's occlusal biomechanics. In addition, the wax-up enabled the assessment of different facial and dental features to create a proper integration of the restorations in the patient's facial and dental framework. The following of the correct bipupillary and bicommissural lines, and facial division midway enable the achiving not only an esthetically satisfactory reconstruction but harmonized with the patient's occlusal interplay. Such an approach is important in large-scope rehabilitations where there are several aspects that need to be addressed to get the required result [12, 13]. Due to the replication of occlusal relationships, such as overbite and overjet, an ideal wax-up facilitated proper evaluation and modification of the vertical dimension of occlussion and other important interferences. This guaranteed that the definitive prosthesis offered both esthetic satisfaction and functional predictability during a finite period of time thus avoiding troubles such as occlusal disharmonies or early prosthetic wear [14,15]. However, as much as one can observe that wax-up technique has been beneficial in the indicated example, it is prudent to note some of the issues that may arise out of this

approach. For example, the thickness and contour of the wax-up is important in order to correctly use the wax up as a guide in preparing the teeth. Excessive thickness although not a strong factor in this context as compared to the conventional mock-ups may obstruct accurate tooth reduction if not carefully controlled [16, 17]. Though this is common in many other complex projects, the case demonstrated here proved that all of the previously mentioned challenges can indeed be minimized and managed to achieve highly satisfactory results. Moreover, lithium disilicate ceramic for the final restorations demonstrates esthetic and function that is enhanced the patient satisfaction and did not show any technical complication in the follow up period. Comparing to tooth structure lithium disilicate has high flexural strength and esthetic properties which makes it suitable for both the anterior and posterior teeth therefore has made significant contribution to the success of the treatment [18, 19]. This case clearly demonstrates the importance of a diagnostic wax-up, especially in complex dental rehabilitations where both aesthetics and function are crucial. While diagnostic wax-ups are valuable for their role in planning, they are even more critical as a working blueprint that enhances the accuracy of restorative procedures. Therefore, incorporating wax-up analysis into similar cases is strongly recommended to achieve optimal results. Therefore, based on the results obtained from the present case, one can conclude that approach described as the wax-up technique when used in conjunction with the aesthetic and functional analysis is an accurate and efficient means of dental rehabilitation. Thus, this approach prevents a simple and elegant design from becoming overly complex or visually unappealing, and it also enhances the overall aesthetic and functional effectiveness of the treatment. Further work should be done to show the full potential of wax-up techniques in the future with special emphasis on digital technologies that could be applied to restorative dentistry [20,21].

CONCLUSIONS

This case report demonstrates the crucial role of the wax-up technique in achieving accurate and aesthetically pleasing outcomes in complex dental restorations. The wax-up provided a valuable framework for precise planning and adjustment, ensuring that both the aesthetic and functional aspects of the restorations were successfully integrated. The use of lithium disilicate as a restorative material further reinforced the importance of selecting materials that closely resemble natural teeth. Overall, the findings highlight the effectiveness of wax-up analyses in enhancing the accuracy and success of complex dental treatments.

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Conflicts of Interest

The authors declare no conflict of interest.

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