



The full-mouth mock-up: a dynamic diagnostic approach (DDA) to test function and esthetics in complex rehabilitations with increased vertical dimension of occlusion

Giacomo Fabbri, DDS

Private Practice, Cattolica, Italy

Giorgio Cannistraro, DDS

Private Practice, Castagnola delle Lanze, Italy

Carlo Pulcini, DDS

Private Practice, San Benedetto del Tronto, Italy

Roberto Sorrentino, DDS, MSc, PhD

Research Professor, Department of Neurosciences, Reproductive and Odontostomatological Sciences, University of Naples, Naples, Italy



Correspondence to: Dr Giacomo Fabbri

Private Practice, Via del Porto 17, Cattolica, 47841, Italy; Tel: +39 0541963434; Email: fabbrigiaco@libero.it



Abstract

The mock-up is a diagnostic technique that allows for the intraoral try-in of a prosthetic rehabilitation. Mock-ups facilitate significant improvement in communication with patients by showing them the potential final outcome of the treatment. They also allow for a quick and easy comparison of the pre- and postoperative situations, and permit the clinician to check the functional aspects of the therapy. The purpose of this article is to describe the use of the full-mouth

mock-up technique for testing all the functional and esthetic parameters of extensive rehabilitations associated with a VDO increase with completely additive wax-ups. The proposed clinical procedures describe an easy and reversible technique to manage complex prosthetic cases with a more conservative and operator-friendly approach compared with conventional prosthetic therapies, reducing time and costs. All the clinical and technical phases of this approach are described step by step.

(Int J Esthet Dent 2018;13:2–16)





Introduction

In restorative dentistry, the mock-up is a diagnostic technique allowing for the intraoral try-in of a 'trial smile,' hence improving the communication with patients and allowing them to be more directly involved in their prosthetic treatment.¹⁻³ This approach permits the application of resin materials onto unprepared teeth to temporarily improve their size and shape as well as to check occlusal function. From an esthetic point of view, the mock-up allows for the closure of diastemata and/or black triangles, simulates the ideal balance between gum lines and teeth, and allows the patient to evaluate the potential esthetic outcome both at rest and when smiling. Therefore, before any esthetic treatment, it is recommended that the patient is enabled to visualize the prosthetic restorations intraorally in order to discuss the potential limitations and outcomes. In this way, the patient is helped to understand the achievable results, and the prosthodontist can assess the patient's expectations. Involving patients in the treatment plan and decision-making process hopefully leads more easily to mutually satisfying outcomes. Furthermore, if the mock-up is designed to remain intraorally for a certain period of time, the patient can carefully evaluate the new smile and suggest possible modifications. Hence the mock-up can be considered the most realistic way of previsualizing the potential functional and esthetic changes for both patients and clinicians, testing the whole impact on the smile.⁴

The mock-up technique is completely reversible: After taking photographs and videos of the pre- and postoperative situations to make static and dynamic

comparisons, the clinician can easily remove the mock-up material and return the teeth to their original condition.

The purpose of the wax-up and mock-up is not only to allow a patient a preview of the final result, but also to serve as a template for the fabrication of the final restorations. Furthermore, the preliminary mock-up can be a useful tool for tooth preparation, as it allows the clinician to perfectly manage the space for the restorative materials and to perform calibrated preparations over the mock-up.^{4,5} The mock-up technique is usually limited to the treatment of anterior areas, mainly to test esthetics and phonetics. However, it can also be used to manage a reversible and effective procedure to evaluate and test functional and esthetic aspects in cases of extensive rehabilitations.

McLaren introduced the bonded functional esthetic prototype (BFEP) that permits the fabrication of up to 14 composite teeth, providing either a pretreatment restoration or a long-term temporary solution until the final treatment can be completed.⁶ After performing conservative tooth preparations, the BFEP technique requires the etching of the facial surfaces of the teeth, the application and light curing of the bonding agent, and the intraoral seating of a silicone matrix loaded with composite resin. Clinicians can benefit from this approach, which enables the provision of segmented treatments with long-term stability, optimal esthetics, and low initial cost.

This article presents the full-mouth mock-up, a clinical approach applying a modified BFEP in clinical situations where an increase of the vertical dimension of occlusion (VDO) is required. Increasing the VDO and opening the interarch



distance are crucial aspects for the optimization of a variety of complex prosthetic therapies. There are many clinical advantages of the technique such as enhancement of esthetic tooth display; correction of anterior tooth relationships to improve overjet and overbite; retrieval of the physiological occlusion; improvement of lip support; reduction/avoidance of the need for surgical crown lengthening procedures and/or endodontic treatments; establishment of anatomical harmony; and minimization of occlusal tooth preparation, recovering vertical space for restorative materials.⁷ Due to these advantages, VDO increase is frequently performed in complex rehabilitations, particularly in order to proceed with minimally invasive procedures and optimize prosthetic outcomes;⁸⁻¹¹ however, the treatment plan should be carefully evaluated, as it is not possible to increase the VDO in all clinical situations, for instance, in cases of hyperdivergent skeletal patterns. In such complex cases, a full-mouth mock-up would be useful to test (using a completely reversible approach) the functional and esthetic aspects of the restoration such as the new occlusion with anterior and lateral guidances, the new VDO, phonetics, and the muscular and temporomandibular joint (TMJ) responses.⁷ Ordinarily, all these aspects of prosthetic treatments are evaluated by means of traditional temporary restorations that represent an irreversible step (as opposed to a reversible one), removing hard tooth tissue and raising the initial cost of the therapy.^{12,13} Conventional provisional prostheses also require tooth preparation in cases of minimally invasive procedures, to remove the undercuts and obtain a

correct insertion path. Therefore, the traditional approach does not allow for the assessment of the effectiveness of a prosthetic therapy with the patient's approval prior to undertaking any treatment. This is particularly limiting in cases where significant occlusal, functional, and esthetic changes are planned.

This article also describes the breakthrough represented by the full-mouth mock-up technique in cases of complex, extensive full-mouth rehabilitations with additional wax-up where a VDO increase is necessary, particularly in the presence of tooth wear and/or erosion (Fig 1). In such clinical situations, a full-mouth mock-up could be a reliable prototype, testing the final prosthetic outcomes both functionally and esthetically with a completely reversible approach. Moreover, the proposed technique also represents a strategic approach to fabricating temporary restorations after the final impression with a unique silicone template, particularly in cases of minimally invasive and partial preparations (ie, table-tops and occlusal-buccal veneers), where the reduced thickness and the presence of undercuts could compromise the management of traditional temporary prostheses. Of course, if occlusal adjustments are necessary during temporarization, a precision impression of the intraorally modified mock-up has to be recorded in order to produce a second silicone template to fabricate the temporary restorations.

This article describes step by step how to manage the full-mouth mock-up technique in case of extensive rehabilitations, focusing on the following issues:

1. Fabrication of the wax-up.
2. Production of the silicone template.

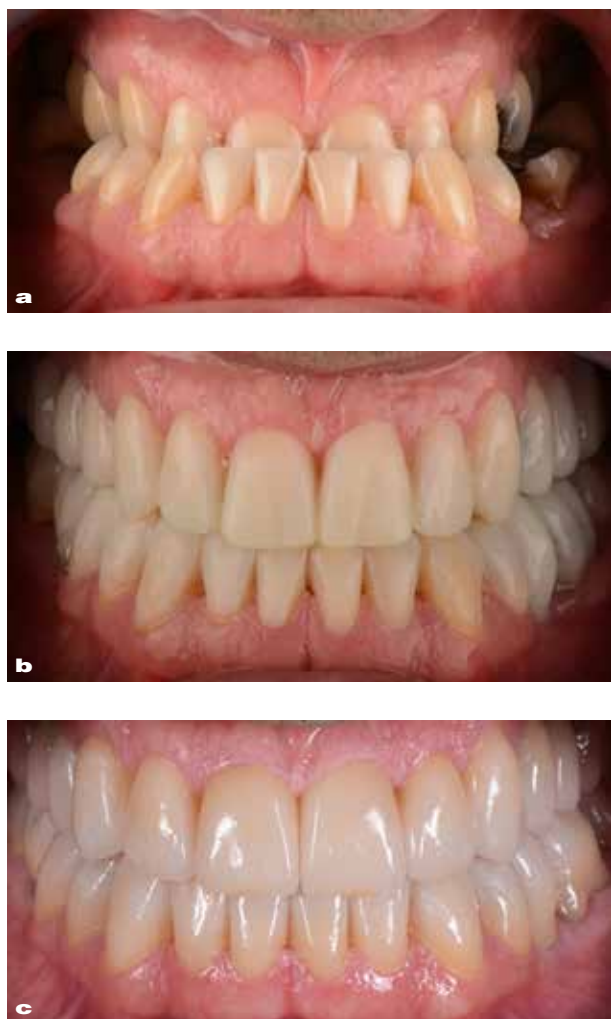


Fig 1 (a) Preoperative view of an Angle Class III malocclusion where the prosthetic treatment requires an increase of the VDO. (b) Full-mouth mock-up bonded onto both dental arches to increase the VDO, correct the occlusal relationships, and perform functional and esthetic evaluations. (c) 3-year follow-up of the final prosthetic outcome finalized with monolithic lithium disilicate (IPS e.max, Ivoclar Vivadent) prostheses reproducing the functional and esthetic modifications tested with the full-mouth mock-up.

3. Intraoral molding and finishing of the mock-up.
4. Maintenance of oral hygiene.
5. Modification and removal of the mock-up.

Materials and methods

Fabrication of the wax-up

The wax-up – a crucial aspect of this technique – requires adequate data collection through a thorough clinical examination, including radiographs, digital photographs, videos, precision impressions, facebow mounting, and interocclusal registration in centric relation (CR). It is crucial to transmit to the dental technician all the functional and esthetic prescriptions for the creation of the additive wax-up, these being the new maxillary incisal edge position, the new VDO (including its management, ie, whether the increase should be performed in the maxillary or mandibular arch, or in both), the modifications of tooth length and position in order to idealize the incisal and occlusal planes as well as the buccal corridors. A thorough esthetic analysis, combined with functional and phonetic evaluations, is paramount to obtaining a complete dataset.¹²

The wax-up should be produced according to the clinician's instructions and without modification of the teeth on the master casts. It is recommended that such casts be very precise, since the prosthetic project, transformed in the wax-up, will be molded intraorally by means of a silicone template. The precision and reliability of this silicone key depends on the exactitude of the casts on which the wax-up is set up; therefore, it is advisable to work on master casts obtained from elastomeric impression materials.

The wax-up for the posterior segments should not be in contact with the soft tissue at the cervical margins, so as to

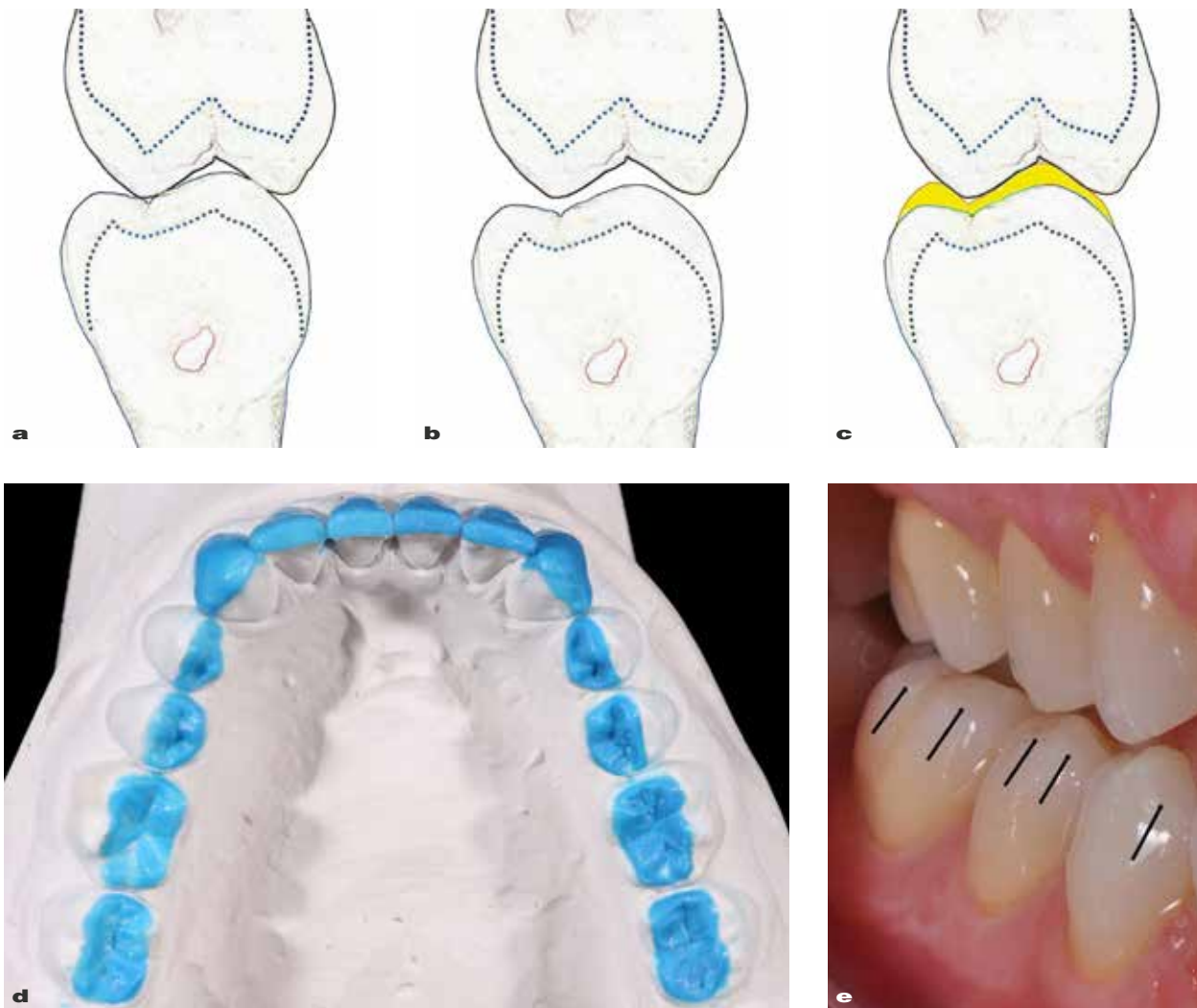


Fig 2 (a) Physiological occlusion in posterior areas with ideal tooth morphology. (b) Increase of the VDO of about 1 mm at the mandibular arch in comparison with the initial situation. (c) The interocclusal space obtained from the VDO increase was used to design an additional restoration limited to the occlusal surface of the mandible. (d) Diagnostic wax-up of the mandible with an increase of the VDO of about 1 mm in the posterior areas. In these clinical situations, the wax-up is limited mainly to the occlusal surfaces of the diastoric teeth, in order to finalize the case with anterior veneers and posterior partial restorations (ie, occlusal table-tops or buccal-occlusal veneers). (e) Detail of the mock-up seated intraorally during protrusion. The black lines indicate the border between the mock-up and the natural tooth. The dental anatomy was fully respected, with only the occlusal surfaces covered and without involving the axial walls.

simplify the intraoral finishing. The critical issue here is the amount of the VDO increase. In fact, in cases with a posterior VDO opening up to 1 to 1.5 mm, it is possible to limit the posterior wax-up to only

the occlusal areas (Fig 2), unless there is the need to also treat the axial walls, as in the case of chemical erosion, abfraction, abrasion or attrition.¹⁴⁻¹⁶ Conversely, in cases of posterior increments greater

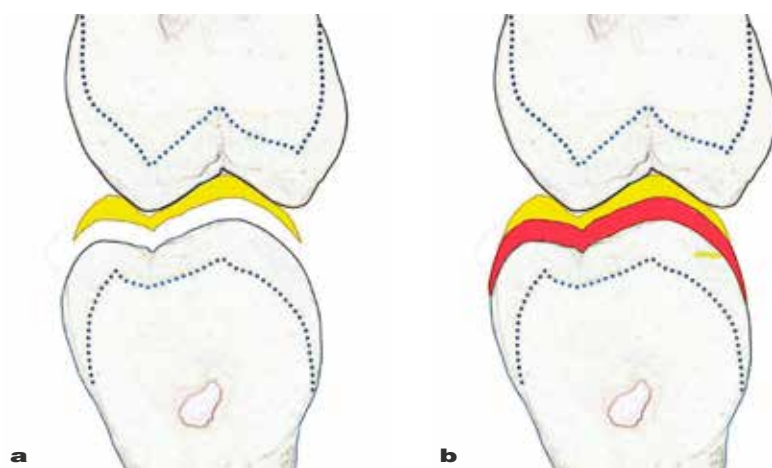


Fig 3 (a) The VDO was increased by 1 mm more than that shown in Fig 2a, to a total of 2 mm. In such a case, the wax-up also has to be extended on the axial walls to retain the restoration's natural contour. **(b)** The drawing shows how it is necessary to modify the wax-up in case of a VDO increase of 2 mm. The deep blue area highlights the location of the margin with an increment of 1 mm; according to the new morphology (light blue area), it is necessary to extend the wax-up apically.

[The colors in this drawing are red and yellow? – authors to advise]

than 1.5 mm, it is necessary to extend the wax-up to part of the axial walls in order to maintain the natural tooth morphology (Fig 3): the higher the posterior VDO opening, the wider the coverage of the axial surfaces. Regarding the final prostheses, significant VDO increases would result in minimal supragingival preparations on the axial walls, defining a slight restorative margin to achieve the best match between teeth and restorations, keep natural morphologies, and avoid supragingival overcontours. According to a completely reversible approach, in the presence of eroded/abraded teeth and preexisting prosthetic crowns interfering with occlusion and the VDO, previous restorations do not have to be removed before fabricating the mock-up, but can be incorporated in the wax-up. The mock-up can then be applied intraorally, as previously described. In case of a diagnostic mock-up, composite resin can be applied onto the preexisting crowns using only mechanical retention; conversely, if the mock-up must be kept in function for several months for diagnostic purposes, coupling agents such

as silane can be applied onto preexisting metal and/or ceramic before molding the mock-up intraorally. Alternatively, once the mock-up has been successfully tested, preexisting restorations can be substituted with temporary crowns at the proper increased VDO.

Production of the silicone template

As previously mentioned, it is crucial that the models used to create the wax-up are accurate so as to achieve a reliable silicone index that can be repositioned precisely in the oral cavity.

In case of mock-ups limited to anterior areas, the posterior segments not involved in the wax-up should be used as reference points for the correct intraoral positioning of the silicone template. Conversely, with extensive or complete mock-ups, the soft tissue mainly represents the landmark for the correct placement of the silicone key. Consequently, it is mandatory to produce a very accurate silicone matrix that perfectly corresponds to the soft tissue anatomy.

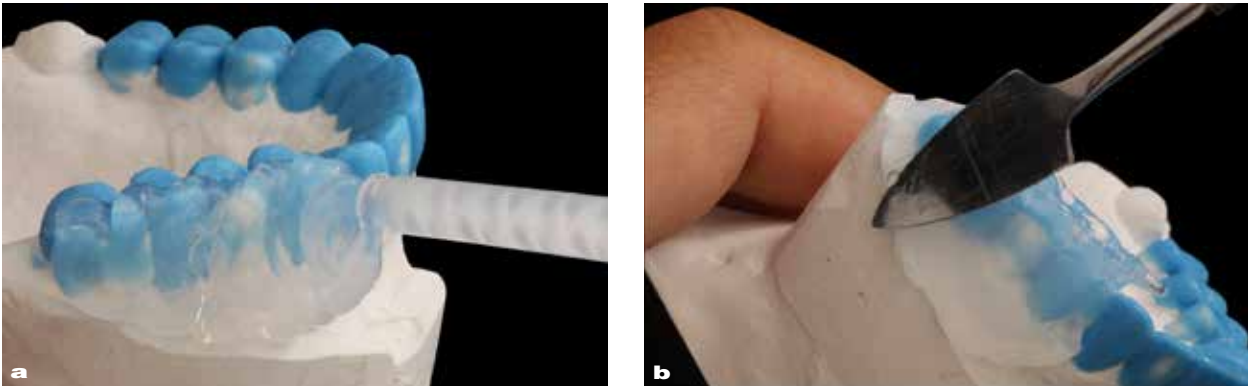


Fig 4 (a) A clear vinyl polysiloxane material is placed onto the wax-up by means of an automix dispenser. (b) The vinyl polysiloxane material is carefully adapted onto the wax-up with a spatula.

With mock-ups limited to the anterior segments, it can be useful to trim the silicone key along the gingival outline to simplify the intraoral removal of the resin materials. However, this approach is not recommended in cases of complete full-arch mock-ups. Since all the teeth are involved in the mock-up and no fixed dental landmarks can be used, the soft tissue component of the silicone key is fundamental in order to precisely replicate its position in the mouth, unless the wax-up in the posterior areas involves only the occlusal surfaces, in which case the axial walls can work as reference points. Therefore, the removal of the soft tissue component from the silicone template could compromise its perfect intraoral seating.

The most important features of the silicone key are precision, stiffness, and thickness. Regarding precision, after setting the wax-up, a clear vinyl polysiloxane (Elite Transparent VPS, Zhermack) is accurately placed onto the wax-up with an automix dispenser, then adapted with a spatula to achieve a perfect fit between the silicone and

the master cast (Fig 4). This transparent material can be used with both self- and light-curing resin materials as it allows for light transmission. To optimize the polymerization of the silicone key, it is recommended to place the silicone matrix seated onto the master cast in a pressure pot at 2 bar for 5 min.

The stiffness and thickness of the silicone index are also important features. The stiffness preserves the silicone from possible deformations during the intraoral molding, while the thickness is paramount for comfortable intraoral positioning and removal. These issues can be managed by combining the silicone template with a 2 mm-thick plastic foil in a pressure thermoforming unit (Erkpress, Erkodent). Once the transparent silicone key is completely hardened, it is necessary to pour dental stone inside the silicone index to support the silicone during the pressure forming of the plastic sheet (Fig 5).

With this approach, it is possible to obtain an ideal silicone matrix that preserves the integrity of the wax-up, which could be jeopardized during the forming

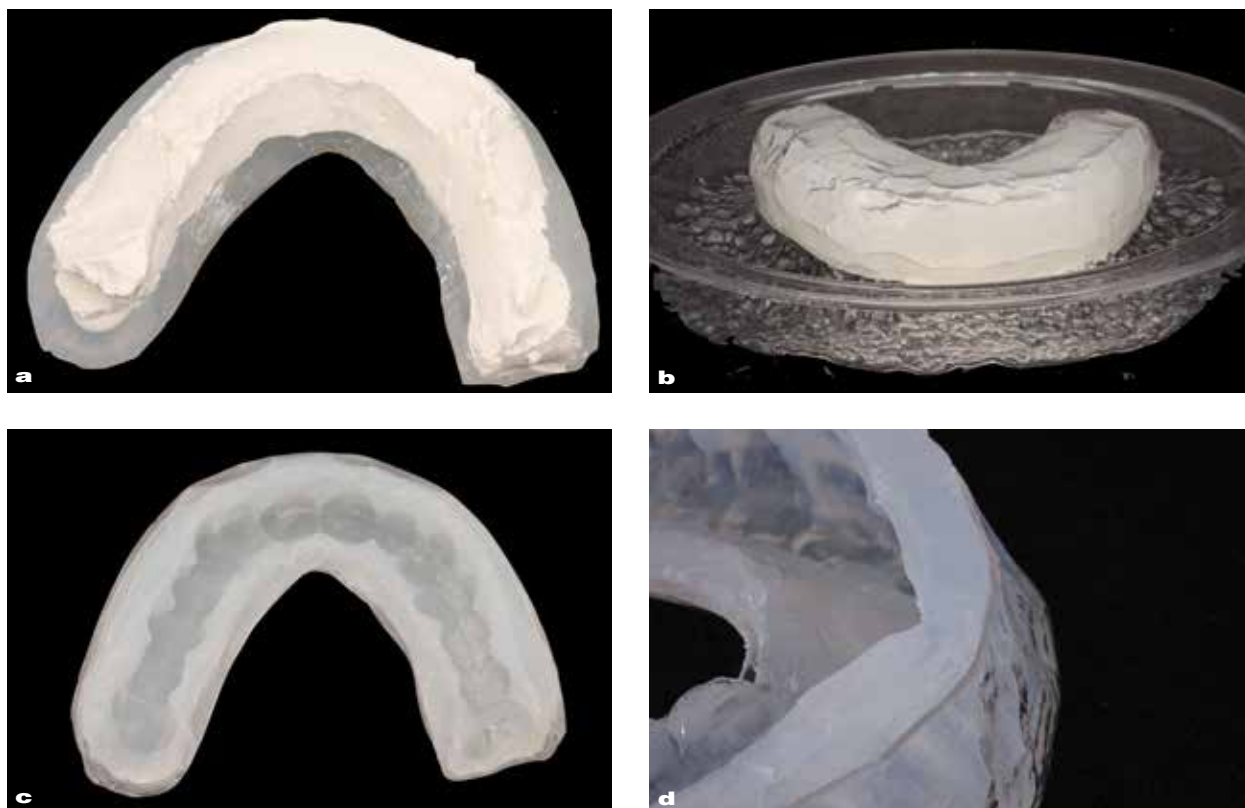


Fig 5 (a) Dental stone is poured inside the silicone index; its rigidity will avoid any deformation of the silicone template during pressure forming of the plastic foil. (b) The plastic foil after pressure forming onto the silicone index reinforced with dental stone. (c) The silicone template after finishing. (d) Detailed view of the silicone index: the limited thickness of the template facilitates the clinical procedures.

of the plastic sheet. Then, the silicone key should be finished in the dental laboratory to remove plastic excesses and any sharp edges.

Intraoral molding and finishing of the mock-up

If the mock-up is planned only to show the patient the esthetic outcome and it is necessary to remove it briefly, a disclosing medium should be applied to the tooth surfaces to facilitate its removal, particularly in the presence of resin-based restorations. Conversely,

in the case of complex, extensive rehabilitations with a VDO increase, the mock-up should be tested intraorally for several months to properly check all the functional, esthetic, and phonetic parameters. Consequently, when the plan is for the mock-up to remain inside the oral cavity for a considerable period of time (as in the case of the BFEP),⁶ it is crucial to create an ideal mock-up that is reliable in terms of volume and morphology, with adequate adhesion between the teeth and the temporary material so as to have a comfortable try-in during function. It must also properly seal the underlying



dental tissue, allowing the patient to perform correct home oral hygiene. The diagnostic mock-up is placed onto the teeth by means of mechanical interlocking only. Once it has been preliminarily accepted by the patient, the functional full-mouth mock-up can be set intraorally. Selective enamel etching and bonding must be performed to create an efficient link between the temporary material and the tooth surfaces. If the mock-up is to remain in place for a short period of time (up to 1 month), it is advisable to proceed with a minimal spot etching approach so as to simplify the removal, if necessary. Conversely, for longer trial periods, an extended etching approach is recommended. Independently of the extension of the etched areas, it is suggested that a bonding agent be used on all the tooth surfaces to properly seal the underlying tooth structures and prevent postoperative sensitivity. It is also recommended to avoid the etching of the incisal enamel of anterior teeth, so as not to compromise the incisal edges if removal becomes necessary. The intraoral molding of the mock-up is performed with self-curing bisacrylates or composite resin materials put into the silicone template and placed onto the teeth with finger pressure until fully polymerized. Further light curing can be performed through the clear matrix. The excess material is then removed at the gingival margins using No. 12 or 15C blades as well as flame carbide or diamond burs. The mock-up is then finished with diamond discs and burs, combined with silicone polishing rubbers and soft wheels. Finally, the esthetic optimization of the full-mouth mock-up is achieved using superficial staining for resin materials, particularly

on anterior teeth and in the interproximal and cervical areas, where the teeth normally appear more chromatic.

Maintenance of oral hygiene

The maintenance of adequate home oral hygiene is paramount to proper periodontal health during the try-in period. Therefore, a careful evaluation of the interproximal areas should be made before creating the wax-up in order to verify the presence of easy access for interproximal brushes. Before intraoral molding, thick Teflon flosses can be placed in the cervical portion of the interproximal areas adjacent to the soft tissue to simplify intraoral finishing and the maintenance of home oral hygiene (Figs 6 and 7). In this regard, the accuracy of the silicone matrix is crucial and can dramatically simplify the removal of temporary material excesses. Where access to maxillary posterior teeth is difficult, mainly between the first and second molars in cases of extreme tooth proximity, both finishing and home oral hygiene could become challenging. The interproximal areas can be opened with thin metal strips, but the procedure can be very difficult when the occlusal aspect of the mock-up is too thick. Alternatively, the option of molding a complete (ie, occlusal and axial) mock-up up to the first molars can be considered, with only an occlusal coverage of the second molars. Alternatively, it is possible to extend the mock-up until the first molars to allow for the use of interdental floss, since occlusal stability and function can be assured with interarch contacts extended to the first molars. The latter approach should be evaluated carefully if

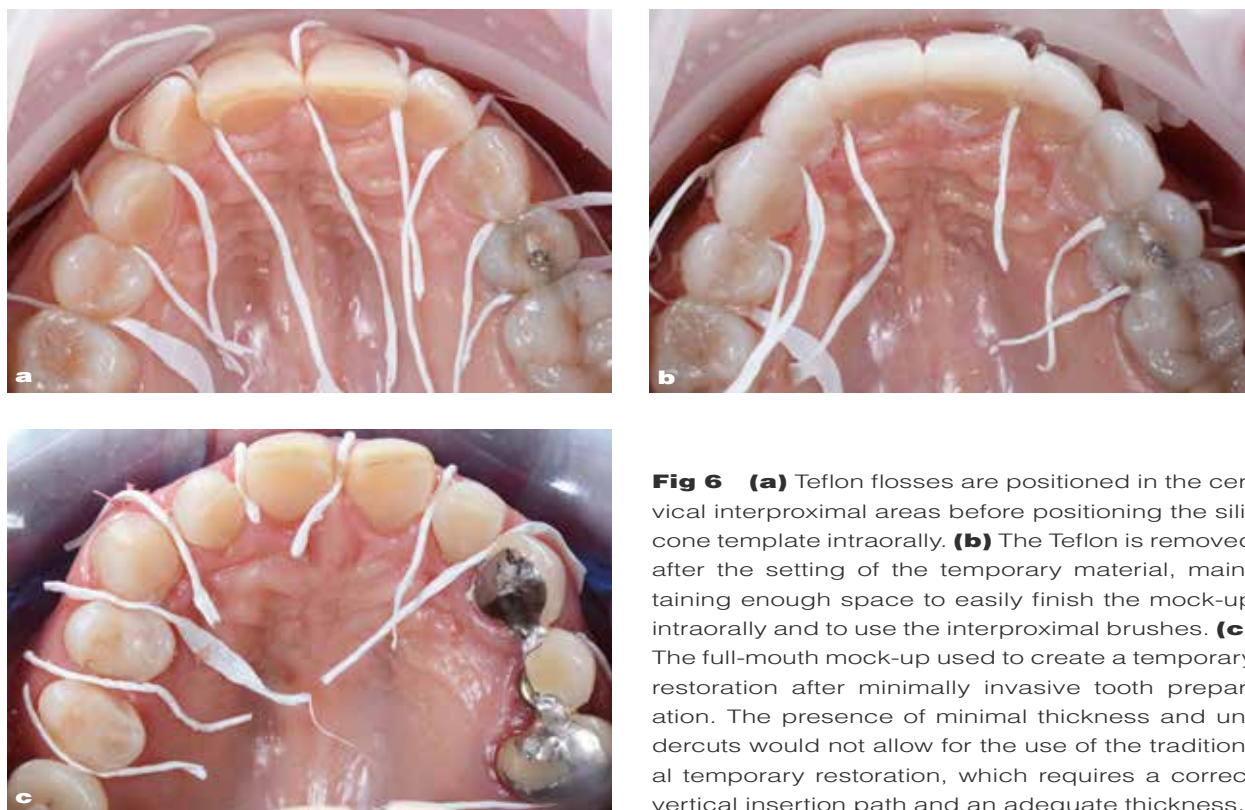


Fig 6 (a) Teflon flosses are positioned in the cervical interproximal areas before positioning the silicone template intraorally. (b) The Teflon is removed after the setting of the temporary material, maintaining enough space to easily finish the mock-up intraorally and to use the interproximal brushes. (c) The full-mouth mock-up used to create a temporary restoration after minimally invasive tooth preparation. The presence of minimal thickness and undercuts would not allow for the use of the traditional temporary restoration, which requires a correct vertical insertion path and an adequate thickness.

the mock-up has to be retained intraorally for several months because of the risk of extrusion of the second molars. In clinical situations with untouched second molars that do not require a restorative structural treatment, this approach can be considered in order to reduce the treatment to the first molar. In fact, in these situations, during the mock-up phase, if the second molars extrude to reach a stable contact with the opposite teeth, it would be possible to avoid the restorative treatment on these teeth. Patients have to be recalled every month for follow-up and professional oral hygiene maintenance. Additionally, the domiciliary use of 0.05% chlorhexidine mouthwash is recommended. This approach reduces the risk of biological

complications such as caries and/or soft tissue inflammation.

Modification and removal of the mock-up

Follow-up recall appointments allow for the verification of the integrity of the mock-up, checking the patient's comfort and all the functional aspects of the new occlusal arrangements.

During the try-in period, the full-mouth mock-up can be modified intraorally to optimize the functional and esthetic aspects in response to feedback from the patient. Selective grinding and changing of dimensions, shape, and proportions with additive composite increments are easy and comfortable procedures

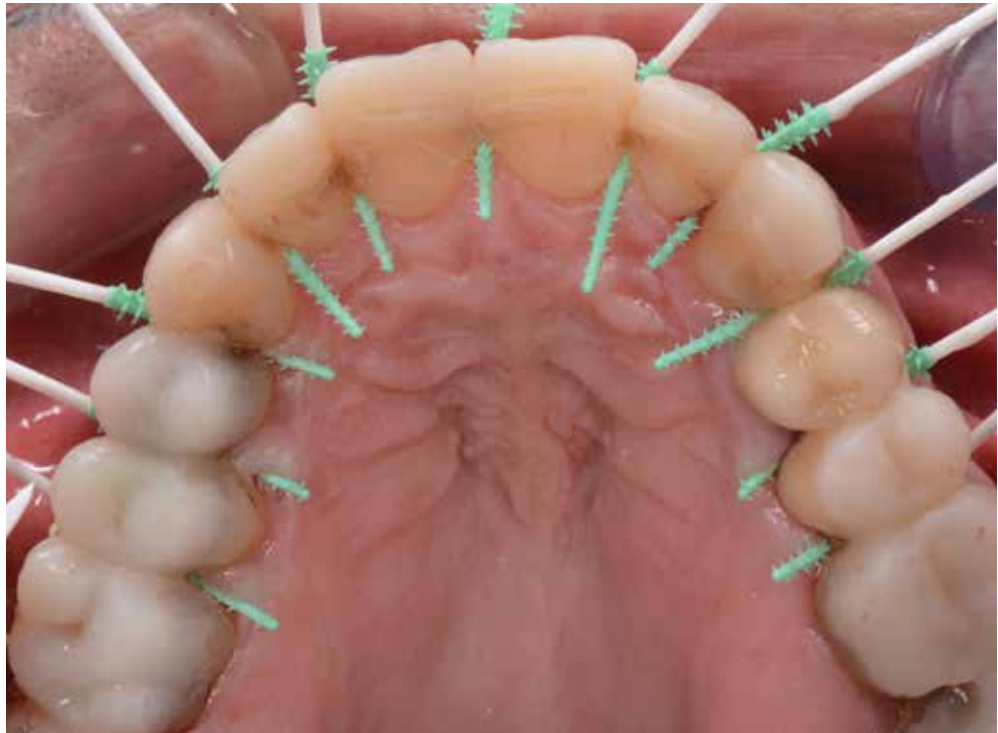


Fig 7 Occlusal view of a full-mouth mock-up after 3 months of function. The hygienic maintenance can easily be performed with interproximal brushes.

that can be performed intraorally without removing the full-mouth mock-up. If fractures occur, the mock-up can easily be repaired intraorally by means of both direct (ie, conventional adhesive resin bonding procedures) and indirect (ie, resin application by means of the molding silicone template) approaches.

Once the patient is completely satisfied and the clinician has checked the functional effectiveness of the prosthetic restoration for an adequate period of time (usually ranging from 30 to 90 days, depending on the specific clinical situation), the final prosthesis can be carried out.

Apart from being used as a try-in, the full-mouth mock-up can also be used as an index to perform calibrated minimally

invasive preparations.^{1,2} Moreover, after taking the final impression, provisional restorations can be fabricated according to conventional laboratory procedures or by overworking the same silicone template used to mold the full-mouth mock-up. In the latter situation, as previously described for long-term functional try-ins, it is mandatory to proceed with a limited spot etch technique in areas distant from the prosthetic margins in order to facilitate easy removal of the provisional mock-up and to not compromise the marginal reliability of the final restorations.

In very infrequent situations where it is not possible to achieve satisfactory functional and/or esthetic results, or where the try-in period shows negative



indications for the final treatment, the full-mouth mock-up can be completely cut out with diamond burs and crown removers in a selective and reversible procedure, restoring the initial situation. To avoid such situations, it is possible to have an initial diagnostic temporarization period using conventional occlusal appliances and a purely esthetic short-term mock-up. Then, once the patient has validated both the functional and esthetic aspects of the restoration, the full-arch mock-up can be used, as previously described.

Obviously, the removal of a full-mouth mock-up bonded with total etching is more complicated and should be performed under magnification in order to preserve the integrity of the underlying tooth structures. Moreover, the removal of a full-mouth mock-up after a complete bonding approach results in inevitable minimal alteration of the original tooth surfaces. Although this represents a drawback of the proposed technique in those infrequent cases where it is necessary to remove the mock-up without completing the planned treatment, the cost-benefit ratio of this approach can be considered very profitable for both patients and clinicians.

Furthermore, it is worth noting that the only alternative to such a conservative technique would be a conventional prosthetic approach with tooth preparation and traditional temporary prostheses, resulting in a definitively irreversible and more invasive procedure that would not allow for the prevention of unsatisfactory and uncomfortable results or functional complications before starting the treatment.

Discussion

This article describes the use of a modified full-mouth mock-up technique for testing the functional and esthetic parameters of complex, extensive rehabilitations associated with a VDO increase with completely additive wax-ups. The mock-up represents a powerful diagnostic tool in many aspects of restorative and prosthetic therapies.¹⁻⁶ Generally, it is used in the preliminary reversible phases of a treatment to improve communication with patients and to show them the potential final esthetic outcome of the therapy.

Moreover, the mock-up is very useful during the clinical procedures to control the thickness of tooth preparations in relation to the final restorative volumes.¹⁻⁵ The most challenging restorative and prosthetic treatments are usually characterized by significant modifications in terms of occlusion, VDO, and esthetic parameters.⁷ A traditional prosthetic approach considers the application of temporary restorations after the preliminary preparation of the residual tooth structures. Consequently, significant tooth tissue sacrifice is required to completely remove the undercuts and achieve a correct vertical insertion path. This procedure represents an irreversible step that does not allow for the reestablishment of the original situation in case of functional and/or esthetic complications. This could represent an important limitation in complex clinical situations in terms of occlusion as well as muscular and TMJ responses (see Fig 1).

Furthermore, a traditional provisional approach necessitates an adequate



thickness of the occlusal and axial walls of the temporary prostheses that nowadays could be excessive for the final restorations due to the possibility of using very thin monolithic crowns.¹⁷⁻¹⁹ The clinical procedures required to apply the modified full-mouth mock-up minimally change the teeth surfaces without compromising the original structural integrity and functionality of the oral cavity; in fact, only adhesive techniques and finishing burs are used to correctly carry out the proposed approach. However, this compromise is absolutely acceptable considering the cost-benefit ratio that the full-mouth mock-up technique offers compared with a conventional prosthetic approach.

Conclusion

The full-mouth mock-up technique is an easy and reversible approach to manage complex prosthetic rehabilitations, particularly when an increase of the VDO is required. It is a more conservative approach compared with conventional prosthetic treatments requiring full-contour interim restorations. Furthermore, it offers patients more psychological comfort as it allows for the reestablishment of the initial situation without compromising the structural integrity of the teeth.

The advantages of the proposed clinical procedure are:

- It allows for a completely reversible testing of all the functional and esthetic parameters involved in a complex rehabilitation.

- In cases with no occlusal and/or esthetic modifications, it permits the use of a unique template to fabricate a diagnostic mock-up, a functional long-term mock-up, a preparation index, and the provisional restorations, reducing both the treatment time and cost. In cases with occlusal and/or esthetic changes, a second silicone index can easily be fabricated to record an impression of the modified mock-up.
- It makes possible the management of temporary restorations in cases of reduced prosthetic space, where a conventional approach would be more complicated and less reliable (see Fig 6c).
- It allows for intraoral modifications over time of the temporary prosthesis with additive techniques, significantly improving patient comfort.

On the basis of the authors' experience, the full-mouth mock-up technique can be considered a safe and operator-friendly approach, particularly in patients with the very compromised occlusal conditions sometimes associated with TMJ and muscle disorders, which require extensive rehabilitations. However, some drawbacks are that the technique, despite being very user-friendly, is operator-sensitive and requires a properly trained and very skilled clinician as well as an expert dental technician. Furthermore, the technique calls for precision impressions, a careful wax-up, and very detailed silicone indexes.

Further clinical studies are necessary to validate the effectiveness of the proposed technique.



References

1. Gürel G. Predictable, precise, and repeatable tooth preparation for porcelain laminate veneers. *Pract Proced Aesthet Dent* 2003;15: 17–24.
2. Magne P, Magne M. Use of an additive wax-up and direct intraoral mock-up for enamel preservation with porcelain laminate veneers. *Eur J Esthet Dent* 2006;1: 10–19.
3. Gurrea J, Bruguera A. Wax-up and mock-up. A guide for anterior periodontal and restorative treatments. *Int J Esthet Dent* 2014;9:146–162.
4. Magne P, Belser UC. Novel porcelain laminate preparation approach driven by a diagnostic mock-up. *J Esthet Restor Dent* 2004;16:7–16.
5. Gürel G, Morimoto S, Calamita MA, Coachman C, Sesma N. Clinical performance of porcelain laminate veneers: outcomes of the aesthetic pre-evaluative temporary (APT) technique. *Int J Periodontics Restorative Dent* 2012;32:625–635.
6. McLaren EA. Bonded functional esthetic prototype: an alternative pre-treatment mock-up technique and cost-effective medium-term esthetic solution. *Compend Contin Educ Dent* 2013;34: 596–607.
7. Fabbri G, Sorrentino R, Cannistraro G, et al. Increasing the Vertical Dimension of Occlusion: A Multicenter Retrospective Clinical Comparative Study on 100 Patients with Fixed Tooth-Supported, Mixed, and Implant-Supported Full-Arch Rehabilitations. *Int J Periodontics Restorative Dent* 2018;38:323–335.
8. Gerdolle D, Mortier E, Richard A, Vailati F. Full-mouth adhesive rehabilitation in a case of amelogenesis imperfecta: a 5-year follow-up case report. *Int J Esthet Dent* 2015;10:12–31.
9. Grütter L, Vailati F. Full-mouth rehabilitation in case of severe dental erosion, a minimally invasive approach following the 3-step technique. *Eur J Esthet Dent* 2013;8:358–375.
10. Fradeani M, Barducci G, Bacherini L, Brennan M. Esthetic rehabilitation of a severely worn dentition with minimally invasive prosthetic procedures (MIPP). *Int J Periodontics Restorative Dent* 2012;32:135–147.
11. Vailati F, Belser UC. Full-mouth adhesive rehabilitation of a severely eroded dentition: the three-step technique. Part 1. *Eur J Esthet Dent* 2008;3:30–44.
12. Fradeani M. Esthetic Rehabilitation in Fixed Prosthodontics, Vol 1. Esthetic Analysis: A Systematic Approach to Prosthetic Treatment. Quintessence, 2004.
13. Fradeani M, Barducci G. Esthetic Rehabilitation in Fixed Prosthodontics, Vol 2. Prosthetic Treatment: A Systematic Approach to Esthetic, Biologic, and Functional Integration. Quintessence, 2008.
14. Litonjua LA, Andreana S, Bush PJ, Cohen RE. Tooth wear: attrition, erosion, and abrasion. *Quintessence Int* 2003;34:435–446.
15. Barbour ME, Rees GD. The role of erosion, abrasion and attrition in tooth wear. *J Clin Dent* 2006;17:88–93.
16. Nascimento MM, Dilbone DA, Pereira PN, Duarte WR, Geraldini S, Delgado AJ. Abfraction lesions: etiology, diagnosis, and treatment options. *Clin Cosmet Investig Dent* 2016;8:79–87.
17. Cortellini D, Canale A. Bonding lithium disilicate ceramic to feather-edge tooth preparations: a minimally invasive treatment concept. *J Adhes Dent* 2012;14:7–10.
18. Fabbri G, Zarone F, Dellificorelli G, et al. Clinical evaluation of 860 anterior and posterior lithium disilicate restorations: retrospective study with a mean follow-up of 3 years and a maximum observational period of 6 years. *Int J Periodontics Restorative Dent* 2014;34: 165–177.
19. Magne P, Carvalho AO, Bruzi G, Giannini M. Fatigue resistance of ultrathin CAD/CAM complete crowns with a simplified cementation process. *J Prosthet Dent* 2015;114: 574–579.