Esthetic provisional restorations using the sandwich technique

Optimized Laboratory-Fabricated Provisionals

Michel Magne, Dr. Pascal Magne, Domenico Cascione, Inge Munck

Provisional restorations serve many purposes in restorative dentistry. High-quality provisionals provide the dentist, dental technician and patient with a lot of valuable information at the start of permanent-restoration fabrication. Acrylic diagnostic provisionals can be easily adjusted and modified until the patient is satisfied with the esthetic and functional result. Using the esthetic provisional as a model, the permanent restoration can be initiated with confidence – without running into unpleasant surprises[1]. Naturally, the fabrication of such diagnostic provisionals takes additional time, but they determine the treatment result in phonetics, esthetics and function.

This article describes and illustrates the efficient and economical fabrication of a provisional from the polymethylmethacrylate material New Outline.

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STRATEGIES FOR THE FABRICATION OF PROVISIONAL RESTORATIONS

Today's exacting patients demand a high level of esthetics and function from restorative dentistry. Optional restorative measures should never be implemented without the treatment team being aware of the patient's expectations and the patient knowing the limits of restorative dentistry. Both the dentist and the dental technician should have a clear idea of what the fnal result will look like before they initiate irreversible therapy. Study models, wax-ups and provisional prostheses give the patient an opportunity to comment on the intended treatment, adjust to the new situation and accept it before the permanent treatment phase is initiated[2]. When setting up the treatment plan, mock-ups, shell provisionals and adapted provisionals are various ways to get an idea of the permanent restoration's appearance, while still providing the patient with an adequate transitional solution during the treatment phase.

THE MOCK-UP

The mock-up is a duplicate in stable methylmethacrylate of the diagnostic wax-up (Figs. 1-2). It can be worn by the patient for several days or weeks and gives a sneak preview, so to speak, of the final treatment result. It can be fabricated either indirectly in the laboratory or directly by the clinician working with the patient. If the patient accepts the result, the mock-up can serve as a preparatory aid to the dentist (Figs. 3-4). This technique is used primarily with adhesive ceramic restorations (Fig. 5).

Figs. 1-2. Literally translated, mock-up means "imitation". It is an acrylic duplicate of the diagnostic wax-up and gives the patient an idea of the possible result.

Figs. 3-4. The second purpose of the mock-up is to help the dentist with the minimally invasive preparation. It stays in the patient's mouth, and only the absolutely necessary quantity of tooth substance is removed for the acrylic.

Fig. 5. This method is especially suitable for the preparation of adhesive ceramic restorations.

Figs. 6-8. The shell provisional is esthetic and functional and requires a minimum of dental input.

Fig. 9. The long-term provisional restoration is complex in fabrication, esthetically pleasing, and highly stable; its marginal fit is excellent – and it shapes the soft tissue for the treatment steps to follow.

"Adapted provisionals are of fundamental importance for molding the soft tissues around the natural teeth and implants"

SHELL PROVISIONAL

The shell provisional is a "first-generation provisional" among individual esthetic provisionals. It combines excellent esthetics and function with minimal dental input for the initial provisional (Figs. 6-8). The fabrication comprises two phases. In the first phase, the shell provisional is built up in acrylic layers in the laboratory and hollowed out from the inside to a minimum thickness. In the second phase, the provisional is relined directly in place on the patient in the dentist's office to ensure a good fit in situ and achieve an optimal marginal fit. Here it is important to use as little material as possible if we want to keep heat generation to a minimum.

ADAPTED PROVISIONAL

The adapted provisional – also known as a "second-generation provisional" or long-term provisional – is the most important step in treatment planning. It serves several purposes concurrently. One is to prepare the patient for the possible new situation. It provides sophisticated esthetics and high precision and, if necessary, helps condition the soft tissue (Fig. 9). The adapted provisional builds on the diagnostic wax-up, which is the starting point for single crowns, bridges and splinted restorations. Adapted provisionals are of fundamental importance for molding the soft tissues around the natural teeth and implants and for active tissue regeneration in the vicinity of bridge pontics. In addition, adapted provisionals help the dentist prepare the patient for the new situation and match his or her esthetic expectations to reality.

SANDWICH TECHNIQUE

The sandwich technique, developed by Michel Magne, is a special technique for the fabrication of

Fig. 10. When making a provisional restoration using the sandwich technique, a wax-up of high functional and esthetic quality is the first step.

Fig. 11. First, the provisional is completely invested in dentin material.

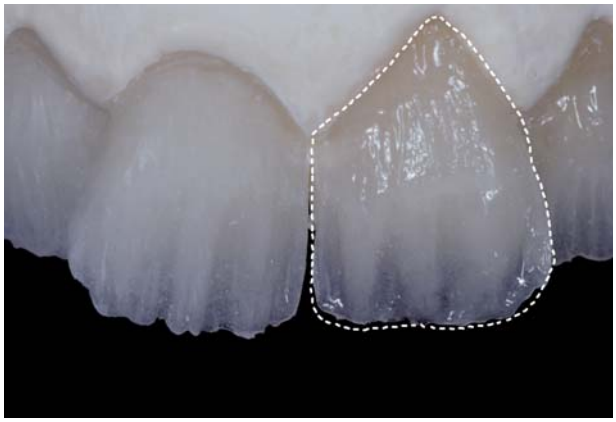

Fig. 12a-12b. When cured, the dentin material is cut back to the desired dentin core, making room for effect and enamel materials.

adapted provisional restorations. It is first and foremost based on the exact reproduction of the natural tooth and the imitation of nature by using several layers of acrylic. This technique can be used for all types of diagnostic provisionals but it is especially suited to the adapted provisional. This technique involves preparing the soft tissue area on the master model around the prepared dies and, if necessary, under bridge elements to match the shape of the wax-up. The next step involves preparation of a silicone key from the diagnostic wax-up (prefabricated wax facets may be used to save money and time). We recommend extending the key to include two further adjacent teeth to ensure secure repositioning.

With the matrix created, the dentin is pressed onto the prefabricated insulated master model (Fig. 11). Curing is performed in a pressure vessel for 10 minutes at 2 to 4 bar and 40°C. The combination of pressure and water has a positive effect on the behavior of the material. It increases its lateral stability and reduces porosity. Following polymerization, the dentin material is cut back (Fig. 12). This serves to imitate the actual form of the dentin in the natural tooth and makes room for the enamel. Due to the reduction of the dentin layer, the otherwise intense opacity is reduced, making it possible to create the impression of a natural incisal edge later. Here we recommend reducing the thickness of the dentin layer only and never decreasing the tooth length (Fig. 13). The relative strength of the dentin and enamel material is of crucial importance for the final result.

In the next step, we conditioned the surface of the reduced dentin with aluminum oxide (5 µm) and treated it with Skin Primer. This ensured that the

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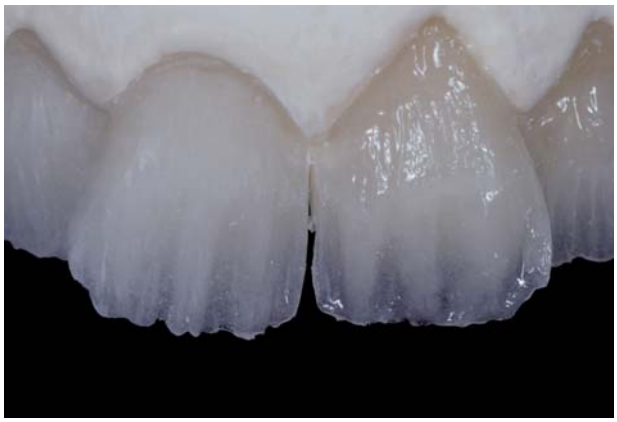

Fig. 13. To obtain a very natural reconstruction, we recommend reducing only the thickness of the dentin layer.

Fig. 14. Light-curing composites and stains are particularly suited to reproducing the desired effects.

Fig. 15. Shade characterization should not be neglected palatally.

"The effect of the dentin core can be reinforced by enhancing shade intensity, shade brightness and translucence, as desired, using carefully positioned stains."

surface was absolutely clean and grease-free and that the next layer of material will bond well. We recommend using light-curing composites and a variety of stains to reproduce the various attributes of the natural teeth and to optimize the impact of internal effects and mamelons (Fig. 14). The effect of the dentin core can be reinforced by enhancing shade intensity, shade brightness and translucence, as desired, using carefully positioned stains. For example, the cervical area with its saturated and gingivally influenced shade may be appropriately customized using yellow-red stains. To adjust the translucence in the incisal area, white and blue may be used. This shade characterization should be implemented both on the labial/buccal and the palatal/lingual tooth surface to reproduce the situation as naturally as possible and to adapt it to the reference teeth (Fig. 15).

If the individual shade characterizations are light-cured, we recommend that the surface be wetted with a thin layer of bonding liquid to ensure good bonding of the enamel materials. Using the various enamel materials in the New Outline kit (light, medium, dark and transparent) and different mixing ratios it is possible to customize the translucence, transparency and shade of the incisal portion of the provisional restoration very successfully. Correctly mixing powder and liquid is particularly important in the case of enamels. It ensures the highest quality material and prevents occurrence of microporosities. The enamel material is pressed over the dentin layer and internal characterization, and it is again pressure-cured. The procedure is a repetition of the dentin-pressing process, and the same silicone key may be re-used after it has been carefully checked.


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Figs. 16-21. The result is very satisfactory: the provisional restoration is as natural-looking and individual as a living tooth.


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Fig. 22. The New Outline Materials System.

Fig. 23. The high value, mid value, and low value enamel materials ...

Figs. 24-28. ... produce different translucence and transparency effects through different mixing ratios.

"Fabrication of a provisional restoration using the sandwich technique is very economical, and it only takes a few steps to reconstruct a natural-looking appearance."

Then any excess is removed, shaping is touched up and finished, and the surface structure is incorporated and mechanically polished to complete the process. Stains may be mixed with a light-cured glaze (Skin Glaze) and applied to the surface to make fine adjustments to match the characteristics of the reference teeth and the oral situation. At this point, the provisional restoration should harmonize perfectly in the mouth of the patient. Fabrication of a provisional restoration using the sandwich technique is very economical, and it only takes a few steps to reconstruct a natural-looking appearance (Figs. 16-21).

MATERIALS

New Outline is a complete materials system (Fig. 22) featuring creative design options and simple handling. It consists of two opaque dentin materials, 11 dentin materials in the A, B, C and D shade hues of the Vita shade guide, three enamel materials and one transparency material. To supplement the system, a white dentin material is available. In selecting the dentin materials, one must pay particular attention to the correct matching of shade hue, brightness and saturation. New Outline may be used both for the indirect technique (fabrication in the laboratory) and the direct technique in the dentist's office. Based on different mixing ratios, the enamel materials – high, mid, low and transparent values – produce different shades with translucence and transparency effects. Universal enamel material (medium brightness), for example, is created from a mixture of 50 percent high value, 25 percent low value and 25 percent transparent (Figs. 22-28). Skin Primer is a bonding agent. It is three times as concentrated as the monomer liquid and produces a permanent


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bond with another layer of the same material. Bonding Liquid is 10 times as concentrated as the monomer liquid and produces a permanent bond with any resin, enabling the user to extend the form or reline an existing provisional restoration. Skin Glaze is an oligomeric urethane-polyacrylate-methylmethacrylate with a photo initiator as an additional component. For the final surface characterization, stains may be added to this glaze liquid. If the provisional restoration has a metal framework, it too can be concealed using a light-curing opaquer supplied with the system.

ADVANTAGES OF THE SANDWICH TECHNIQUE

One advantage of the sandwich technique in fabricating long-term provisional restorations is the highly esthetic result, which is maintained throughout the treatment period. Machine polishing can be used to achieve extremely good surface homogeneity, which in turn results in excellent tissue compatibility. Using internally achieved effects, the shade impression remains stable, which is an important factor especially if the provisional restoration is in the esthetic zone and will be worn over an extended period of time[3]. Another advantage is clearly the fact that this technique enables a dental technician to learn in a hands-on way how to make natural-looking crowns using PMMA and a simple technique. Experienced dental technicians can give free reign to their personal creativity. However, the sandwich technique requires not only precise knowledge of the dental anatomy but also intuition, sensitivity and a keen sense of the natural model[4].

ADVANTAGES OF POLYMETHYLMETHARCRYLATE (PMMA)

Clinical experience has shown that the materials best suited for provisional restorations are characterized first and foremost by flexibility and elasticity. This is where the PMMA reveals its true value. If a material is too rigid, it cannot absorb force effects and consequenctly will tend to be brittle and to fracture. Several studies have also shown that some PMMA-based resins have fewer tendencies to discolor than other materials used for provisionals, such as bis-acrylate. A review of the pertinent literature shows that this is not a property of the material category, but of the specific material itself[5-9].

ADVANTAGES OF NEW OUTLINE

In the long experience the authors have with New Outline, provisional restorations may be worn for up to one year without losing their esthetic properties or undergoing appreciable discoloration. There are also several financial, practical and technical aspects that support the use of this material. New Outline is a very homogeneous and compact PMMA material of high density. The surface therefore exhibits excellent soft tissue compatibility and is also highly resistant to abrasion following mechanical polishing or the application of Skin Glaze. The stable shade intensity of the various dentin and incisor materials available makes it possible to create an optical impression of high quality.

CONCLUSION

Provisional restorations are a key milestone along the way to a comprehensive esthetic treatment solution. In particular, they provide indispensible diagnostic information, make a significant contribution to the conditioning of the affected soft tissue, and contribute to the patient's comfort and ease during the treatment period of the treatment. A correct treatment approach is critical to the result[10].

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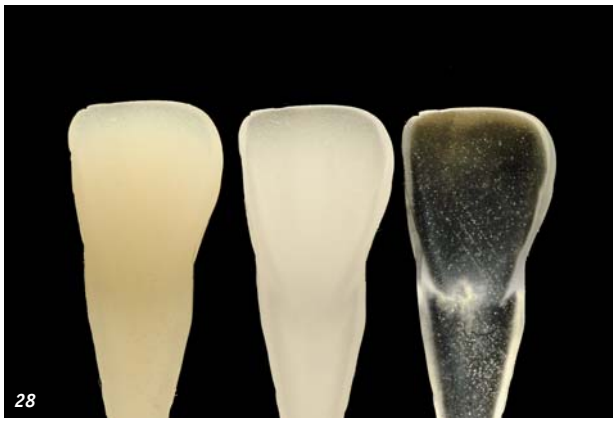

PRODUCT LIST

Indication	Name	Manufacturer/Distributor
Acrylic for provisionals	New Outline	Microstar
Wax facets, prefabricated	Form Up	Schuler Dental

"PMMA is one of the materials best suited for provisional restorations. "

In every treatment, the main focus is ultimately on the formulation of the correct diagnosis and subsequent treatment approach, and this is where provisional restorations play a crucial role.

In terms of length, form, tooth position, wearing comfort and phonetic aspects, the permanent restoration should simply be a copy of the provisional restoration that the patient has determined to be acceptable.

PMMA is one of the materials best suited for provisional restorations. It exhibits high durability because of its elasticity. Its homogeneity ensures good tissue compatibility, and its optical quality guarantees good adaptation to intraoral conditions.

The material and its application have a number of advantages and are well suited as the first step in the approximation of an optimum treatment result, and to the preparation of the patient for the new situation. The recipe for success lies in the combination of a sophisticated technique with a superb material. In the opinion of the authors and based on various studies, there is no material better suited for the fabrication of provisional restorations than polymethylmethacrylate at this time. dental dialogue

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Bio

Michel Magne, CDT, has been a dental technician since 1979, specializing in fixed restorations with an emphasis on ceramics and esthetics. From 1985 to 1991, he was chief ceramicist of two laboratories and specialized in implant-supported restorations and complex oral rehabilitations. From 1992 to 2004, he owned and managed a dental laboratory. In January 2005, he was appointed associate professor of clinicial dentistry and director of the center of dental technology of the University of Southern California, where he teaches courses in esthetics and function for postgraduate students. He has authored and co-authored various articles on cosmetic dentistry and is a frequent speaker at international events. He is a technical consultant for the companies Straumann and Zhermack.

Dr. Pascal Magne completed his postgraduate studies in prosthetics and surgical dentistry at the University of Geneva, where he had already been teaching, in 1997. As the recipient of several scholarships, Dr. Magne was able to spend two years at the University of Minnesota conducting research in the areas of biomaterials and biomechanics. In 2002, he returned to Geneva and he was awarded his doctorate. From 1999 to 2004, Dr. Magne lectured in Geneva. In February 2004, he was appointed tenured associate professor at USC, where he teaches Esthetic Dentistry. He is the author of the textbook Bonded Porcelain Restaurations, has authored numerous articles on esthetic and adhesive dentistry and is an internationally renowned speaker.

Domenico Cascione has been a dental technician since 1985 and a laboratory owner since 1986. His areas of specialization are metal, implantology and ceramic restorations. Since 1990, he has been a consultant for Metalor Technologies Italy. Since 2005, he has consulted for Zhermack SpA, Italy. He has been working at USC, with Dr. Pascal Magne and Michel Magne since January 2005.

Inge Munck has been a dental technician since 1987. She specializes in the areas of fixed restorations and continues her studies of practice and theory. As a dental technician, she works in the areas of all-ceramics and pressed ceramics. Munck has been working at USC with Dr. Pascal Magne and Michel Magne since January 2005.

Contact Information
Michel Magne
mmagne@usc.edu