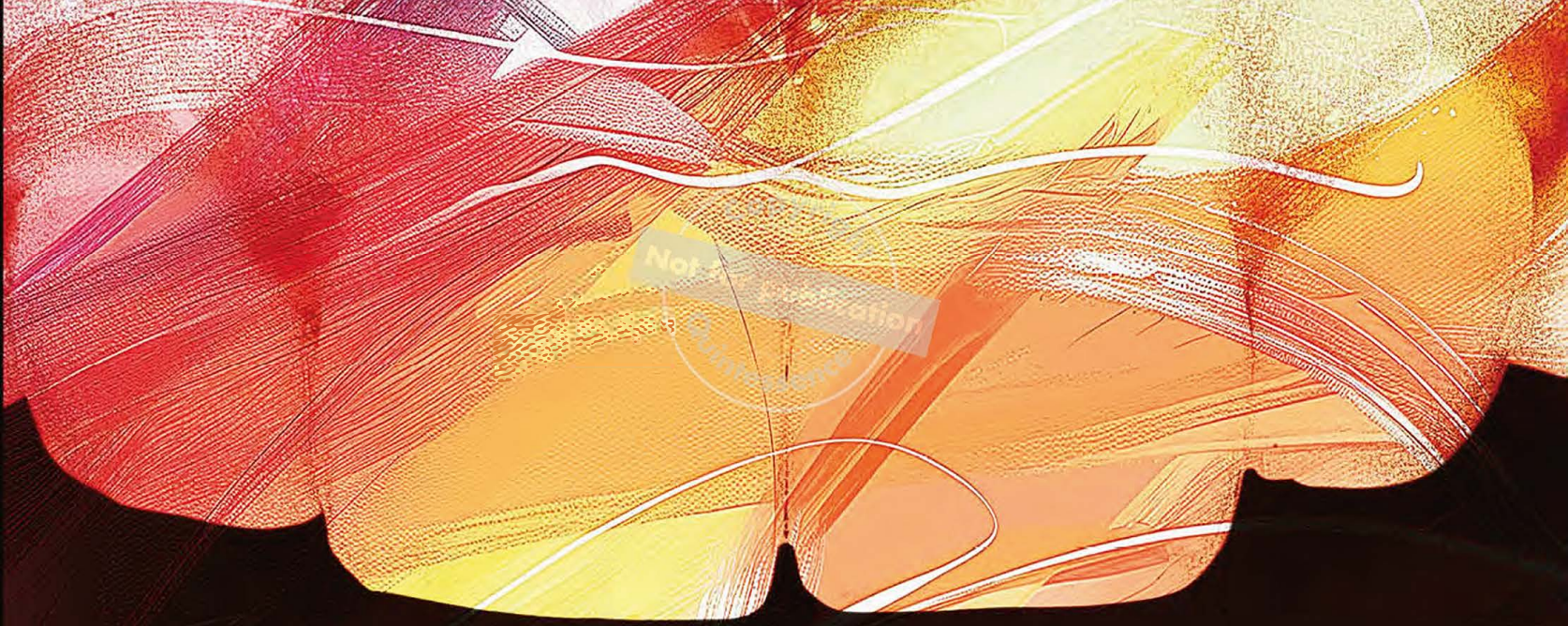

MINIMALLY INVASIVE ESTHETIC DENTISTRY

"No Drill" Techniques

MARIO F. ROMERO, DDS

QUINTESSENCE PUBLISHING

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FOREWORD

In an era when "esthetic dentistry" frequently entails blithely cutting away enamel to replace it with restorative material, my friend and long-time colleague Dr Mario Romero ably demonstrates in these pages how the esthetic needs of patients can often be addressed much more conservatively. Dr Romero has long recognized that the cost/benefit analysis for a patient receiving esthetic treatment should include not just the monetary impact but also the loss of an irreplaceable tissue—enamel. Preserved enamel can be used to support any retreatment that may become necessary, which is an important consideration given the longevity of many of our patients.

Dr Romero's dedication to excellent esthetics balanced with cost effectiveness and the preservation of enamel is nowhere more evident than in his use of home whitening and other methods of altering the appearance of teeth that don't involve restoration, as well as in his use of conservative direct resin composite and ceramic restorations that require minimal or no tooth preparation for esthetic recontouring. Readers of this text will find the presented techniques to be well reasoned and very manageable and approachable within the constraints of private practice. These techniques greatly facilitate the performance of predictable and efficient dental treatment with excellent esthetic results.

Dr Romero also appreciates the technique sensitivity of adhesive procedures and the fundamental role of effective isolation in treatment success. He gives evidence-based advice on how adhesive techniques should be adjusted in various clinical circumstances, and he offers simplified isolation techniques developed during his extensive experience in private practice that are well accepted by patients and offer both improved quality and efficiency.

I can promise readers of this text that they will both enjoy and be gratified by the employment of the presented treatment techniques and concomitantly earn profound appreciation from their patients.

William W. Brackett, DDS, MSD
Professor Emeritus
Operative Dentistry and Fixed Prosthodontics
Department of Restorative Sciences
Dental College of Georgia

PREFACE

Ever since I was in dental school, I knew that teaching would be part of my path, and it has been an aspect of my career that I have enjoyed tremendously. I used to ask myself, "What do I need to do to leave an indelible mark on my students?" It did not take much searching for me to find the answer. While teaching at the Dental College of Georgia, I met four professors who were textbook authors. One of them was my department chair, and during a conversation about his complete denture textbook, my question was answered. My next big project would be to summarize my views of conservative dentistry and share them with the world through a publisher like Quintessence.

Some dentists may find it inconceivable that esthetic dentistry can be performed without the removal of dental enamel, a tissue that I have learned to appreciate so long as there is no biomaterial that can truly mimic its characteristics and beauty. Ceramics are very close, but they lack one important feature—longevity; only enamel can last forever. My appreciation of enamel led me on a search for ways to improve patient smiles without the need for a dental drill. To my surprise, I found many minimally invasive treatment modalities that can improve patient smiles based on one concept that is often neglected by clinicians: Beauty is in the eye of the beholder. Not every patient who sits in our dental chair is looking for a Hollywood smile. If you understand this concept alone, I assure you that your treatment plans will become more conservative in nature.

Nightguard bleaching, microabrasion, resin infiltration, and no-prep composite and ceramic restorations are excellent examples of this philosophy of care and are the essence of this text. I am sure that regardless of your experience level, this textbook will provide you with many clinical tips to improve your treatment outcomes.

ACKNOWLEDGMENTS

I want to start by thanking my Lord Jesus Christ, to whom I owe everything. Without his blessings and the many gifts he has provided me throughout my life, this book would not have been possible.

To my mother, Dr Sonia Félix, an oral and maxillofacial surgeon by profession with whom I shared the first 15 years of my career. I was always inspired by her willingness to give only her best to patients. She served tirelessly for 35 years at a children's hospital to help thousands of babies in Ecuador have a beautiful smile.

To my father, Jorge Romero, for his dedication to his family and for serving as an example of hard work and perseverance even in the most difficult situations. His efforts provided me all the necessary tools to complete and further my education.

To my beautiful wife, Joanna, who has been by my side since we were teenagers and has given me four wonderful children (Mario, Joanna, Sonia, and Alejandro). She has supported every one of my dreams and has been fundamental in the great effort of putting this book together. Thank you for believing in me.

To my former restorative sciences department chairs at the Dental College of Georgia, Drs Michael Myers and Kevin Plummer, for giving me the opportunity to share my clinical experience with many young dental students and residents. It was during those countless hours that I was able to gather much of the scientific information shared in this textbook.

To my colleagues Drs William and Martha Brackett, Courtney Babb, Megan Todd, Todd Schoenbaum, and Roger Arce with whom I've shared hundreds of teaching hours in operative and restorative dentistry and who are all very supportive of the minimally invasive techniques presented in this book. Their continued support is where I found the needed inspiration to complete this task.

To my students and residents at the Dental College of Georgia who made valuable contributions to this textbook: Drs Mathew Yeung, Phil Jenkins, Christine Keyser, Cassandra Mitchell, Jackie Janzen, Marcus Cowan, Ashley Farmer, Alex Dean, Benjamin Alverson, Maria Tibavinsky, and Madison Lively.

Finally to the faculty at the University of Guayaquil School of Dentistry (my alma mater), with special gratitude to Drs Wenceslao Gallardo, Gustavo Restrepo, and Diego Loza. Their dedication to enriching the lives of young dental students has served me as example throughout my career.

1

INTRODUCTION TO MINIMALLY INVASIVE DENTISTRY

When writing about amalgam restorations in 1951, Dr Myles Markley wrote that "the loss of even a part of the human tooth should be considered a serious injury" and that "dentistry's goal should be to preserve healthy, natural tooth structure."[1] While lecturing to a study club in the mid 1970s, Dr Peter K. Thomas included a quote on one of his slides that read, "Clinicians must first be interested in saving natural teeth, and only if this is really impossible can they start to plan how to replace them."

Many teeth today are extracted and replaced with an implant for the simple fact that it seems too laborious to restore them to function. However, a great number of these extractions are performed on young and middle-aged adults who statistically have 30 to 50 more years of life ahead of them. If we consider the high probability of mechanical and/or biologic implant complications, it makes sense to give our best effort to maintaining a patient's natural teeth for as long as possible so that we both reduce the time a future implant will be in function (allowing less time for the development of complications) and preserve the surrounding alveolar bone (in the event of a catastrophic failure of the tooth). Thanks to advancements in adhesive dentistry, many teeth that once seemed impossible to restore can now be restored predictably.

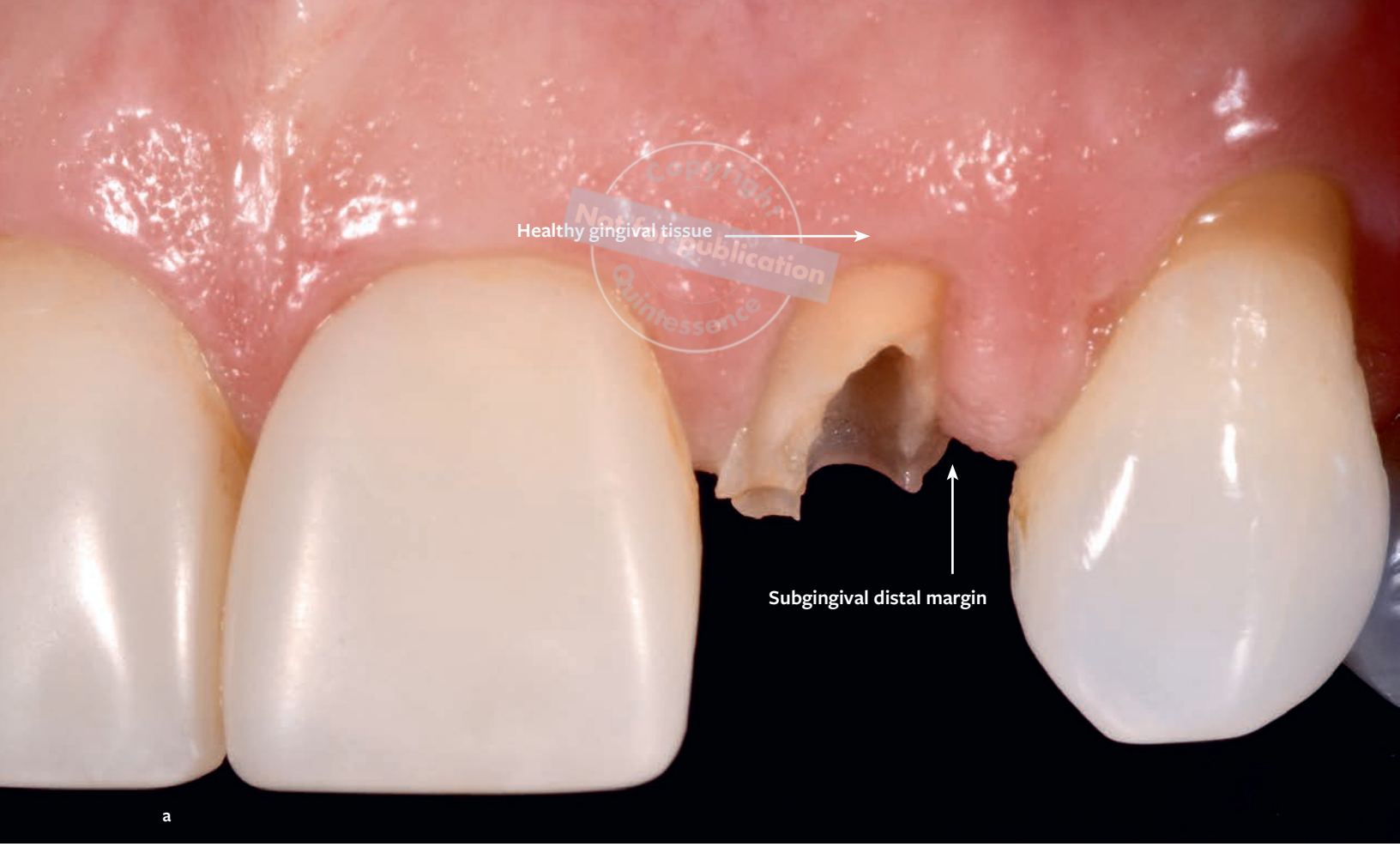


FIG 1-1 (*a*) Fractured lateral incisor with no remaining enamel and a subgingival distal margin. (*b*) Radiograph showing healthy periapical tissues.

CASE STUDY

As an example of minimally invasive dentistry, I would like to share with you the following case. A patient presented to my office with a fracture in the maxillary left lateral incisor extending to the gingival margin. The tooth had a history of endodontic treatment from over 25 years prior, and the periapical tissue presented within normal limits (Fig 1-1). The fracture occurred 24 hours before the patient arrived at the office. All maxillary incisors had been restored by me with composite resin veneers 4 years prior to the fracture (the 1-year follow-up from that original treatment is shown in Fig 1-2). Because of the healthy condition of the remaining tooth structure, we decided to follow a conservative approach and restore the tooth with a direct fiber-reinforced composite restoration. The clinical steps for this procedure are presented here.

Dental substrate:

1. Perform an intraoral scan and develop a digital wax-up.
2. 3D print the wax-up, and use it to fabricate a palatal matrix from putty (Fig 1-3a). Alternatively, an analog wax-up can be used.

FIG 1-2 Composite veneers on the central and lateral incisors 1 year after treatment.

3. Perform rubber dam isolation. Here, a combination of W2 clamps, a modified 212 clamp, and polytetrafluoroethylene (PTFE) tape was used to position the rubber dam away from the distal margin of the fracture (Fig 1-3b). To add stability to the modified 212 clamp, it is recommended to add block-out resin such that it wraps around the bow of the clamp and secures it to a neighboring tooth (Fig 1-3c).
4. Make sure the putty matrix fits passively against the neighboring teeth (Fig 1-3d). If it does not, trim it until full seating is achieved. This step is very important because it determines the proper location of the palatal surface of the restored tooth.
5. Use a handpiece to remove 2 to 3 mm of gutta percha from the canal.
6. Acid etch the entire tooth remanent, including the inside of the canal, for 15 seconds (Fig 1-3e).
7. Rinse and dry the tooth, but do not desiccate it (Fig 1-3f).
8. Apply two to three coats of primer (OptiBond FL Primer, Kerr Dental; Fig 1-3g), followed by air thinning for 10 to 15 seconds.
9. Apply two to three coats of Kerr OptiBond FL Adhesive (see Fig 1-3g), followed by removal of the excess using a dry micro brush. This is followed by light curing for 20 seconds.
10. Reinforce the tooth. We used a polyethylene fiber (Construct, Kerr Dental) approximately 7 mm in length. This fiber is gas plasma treated and impregnated with silane and resin. Prior to inserting it into the canal, the fiber must be impregnated with flowable resin (Figs 1-3h and 1-3i).
11. Wet the canal with flowable composite and insert the polyethylene fiber (Fig 1-3j). Use the putty matrix to verify that the fiber is centrally located (buccopalatally) (Fig 1-3k). This is a very important step because the fiber needs to be completely covered with resin upon completion of the restoration.
12. Fill any voids in the canal with flowable composite, followed by light curing (Fig 1-3l).

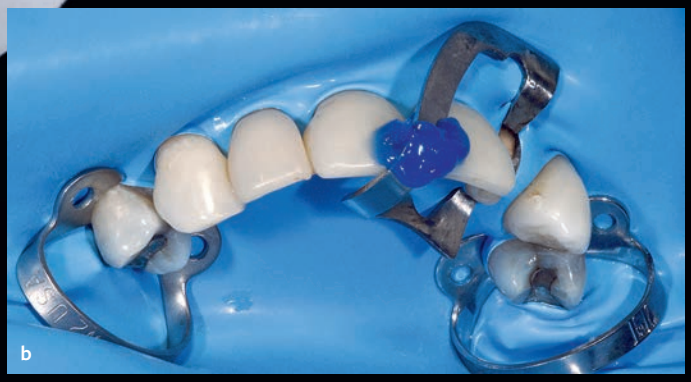


FIG 1-3 (*a*) Printed model of the digital wax-up. (*b*) Modified 212 clamp in place. Note the additional W2 clamps located on the premolars. These clamps help secure the rubber dam and eliminate tension near the modified 212 clamp. (*c*) Block-out resin added to stabilize the modified 212 clamp. The blue resin wraps around the bow of the clamp and touches the underlying tooth. (*d*) Putty matrix try-in. Notice that it is trimmed for full seating. (*e*) Total acid etching using 37% phosphoric acid. (*f*) The tooth was rinsed with water for 20 seconds and dried. I recommend using a paper point to remove excess water from the canal access.

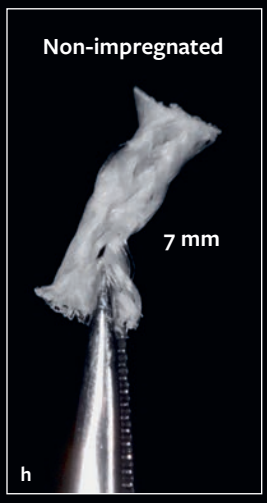


FIG 1-3 cont (*g*) Kerr OptiBond FL Primer and Adhesive. (*h and i*) Construct polyethylene fiber. (*j*) After wetting the fiber with flowable composite, insert it 2 to 3 mm into the prepared canal space. (*k*) Verify that there is palatal, facial, and interproximal space for the composite resin, as the fiber needs to be fully covered by it. Using the putty matrix guide makes this step easy. (*l*) Polyethylene fiber in its final position after light curing. Additional flowable composite was added in the canal prior to light curing to eliminate voids.

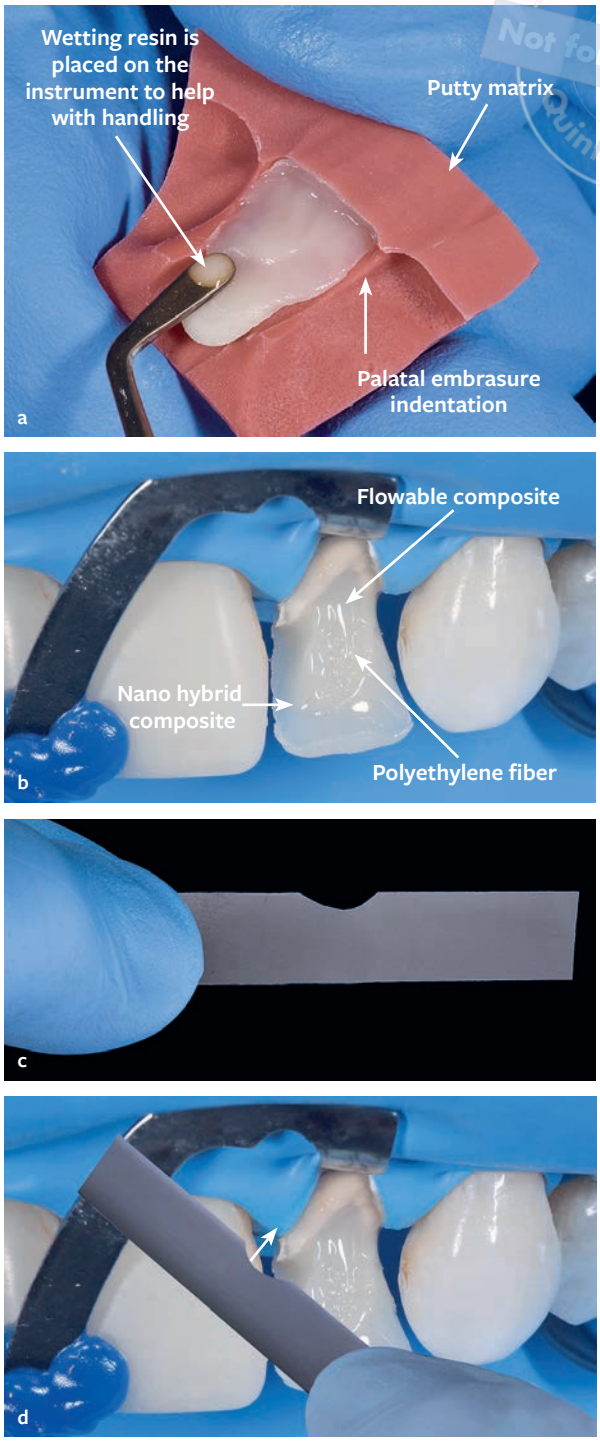
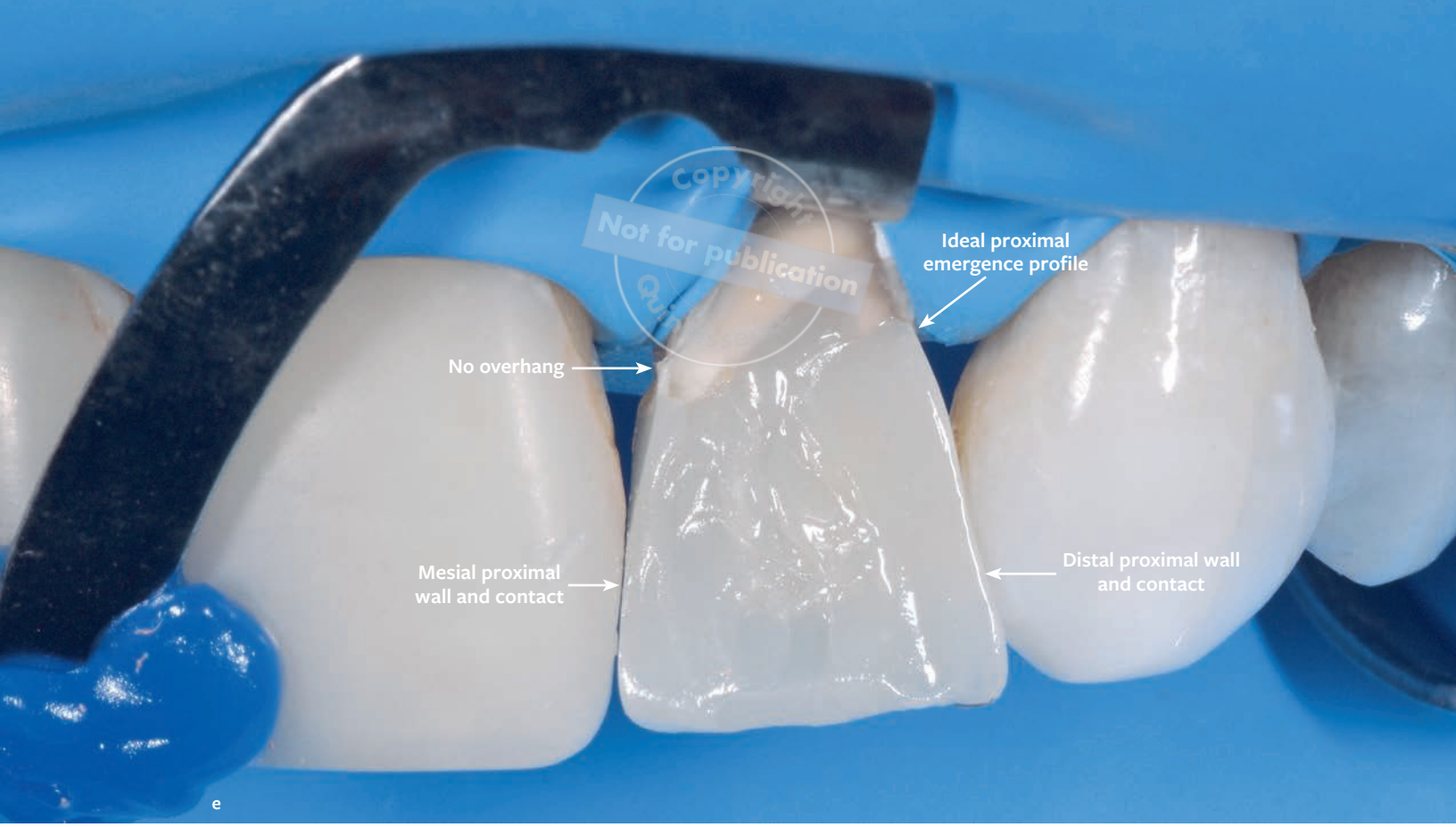


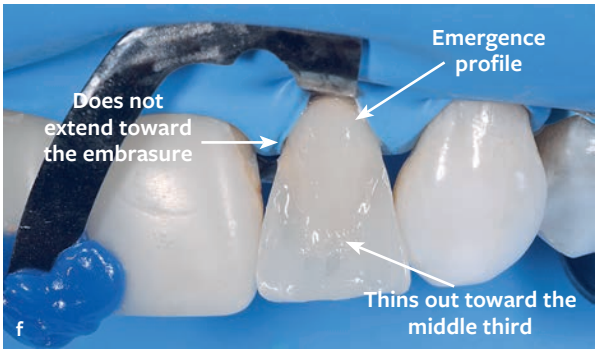
FIG 1-4 (*a*) First composite layer being applied directly to the putty matrix. (*b*) Completed palatal layer. Note the uniformity of the surrounding composite and the fiber. (*c*) Modified Mylar strip. This modification will allow the strip to be placed more apically into the gingival embrasure (below the gingival margin), allowing for better adaptation. (*d*) The *arrow* indicates where the notch should be located after placing the Mylar strip interproximally. This will allow for sculpting of the proximal walls and contacts.

The restoration:

1. Start by building the restoration from the palatal aspect toward the facial layer. Apply the chosen composite directly to the matrix guide using a composite instrument. For this case, we decided to use Brilliant EverGlow (Coltene) in shade A2/B2, combined with a final translucent (Trans) layer. It is helpful to use wetting resin to model the composite and adapt it to the matrix as well as possible. This facilitates replication of the palatal anatomy and reduces the possibility of air bubbles. The thickness of this layer should be around 1 mm (Fig 1-4a).
2. Apply a thin layer of flowable composite to the palatal side of the fiber, but do not light cure. This is followed by sitting the matrix on the neighboring teeth until the palatal layer of composite and the fiber come together. Using the composite instrument, sculpt the composite so that it adapts well to the remaining tooth structure; then light cure for 20 seconds (Fig 1-4b).
3. The next step is to build the proximal walls and interproximal contacts. For a case where the remaining tooth structure is at the gingival level, the Mylar (Mylar Specialty Films) strip must be modified so that it can be placed more apically, thus allowing for better adaptation to the remaining tooth structure and preventing the creation of overhangs. This modification is accomplished with curved scissors used to cut a semilunar notch on one side of the Mylar strip (Figs 1-4c to 1-4e).
4. The gingival layer is next, and it determines the facial emergence profile. This layer should not extend into the gingival embrasures and should thin out toward the middle third of the tooth (Fig 1-4f).
5. The body layer follows and should extend toward the incisal third. Once the body layer is completed, there should be no transition line between the gingival and body layers (Fig 1-4g).
6. To obtain ideal facial contours, I recommend dividing the final translucent layer into three parts: the mesial line angle, the distal line angle, and the facial layer. I prefer using the Mylar pull technique for the line angles. Start with the mesial line angle by placing a Mylar strip in the interproximal space with its long



side toward the facial aspect. This is followed by injecting the composite, starting at the gingival area and moving continuously toward the incisal edge (Fig 1-4h). A composite instrument is used to sculpt the layer toward the mesiofacial. Make sure the layer "sticks" to the Mylar strip. This is followed by slowly pulling the Mylar strip palatally while placing the end of the composite instrument into the mesiogingival embrasure to create a wedge effect and prevent uncured composite from entering this area. You can smooth the line angle using an artist brush until the desired shape is obtained, followed by light curing for 20 seconds (Fig 1-4i). Repeat the same steps for the distal line angle (Fig 1-4j). The final facial layer is placed between the line angles. I like using an artist brush combined with wetting resin to make this composite layer blend in without leaving any stroke lines as well as to get rid of air bubbles (Fig 1-4k). Figures 1-4l and 1-4m show the completed layered restoration prior to finishing and polishing. Note the smoothness of the layers and the presence of natural contours.



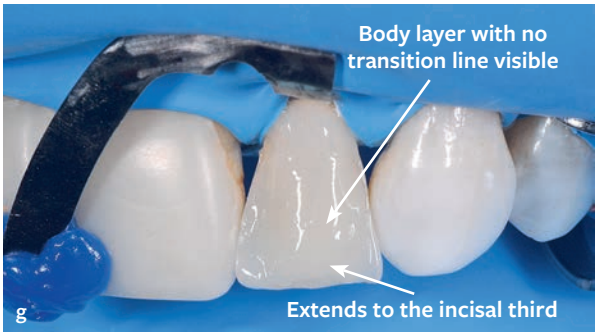
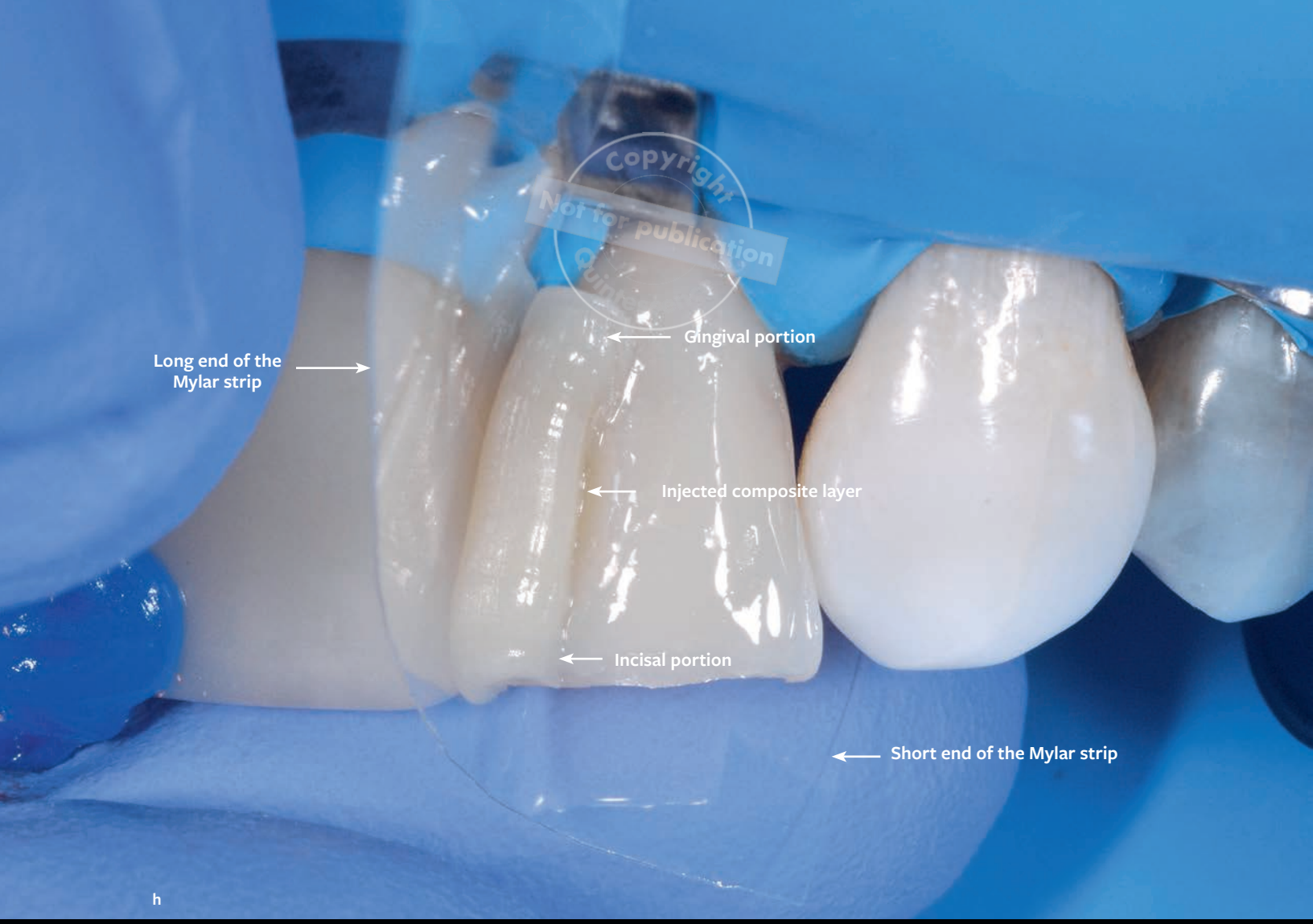


FIG 1-4 cont (*e*) Completed proximal walls and established interproximal contacts. (*f*) Gingival layer after placement and polymerization. Note that this layer does not extend to the gingival embrasures. (*g*) The body layer is a continuation of the gingival layer and should extend to the incisal third.



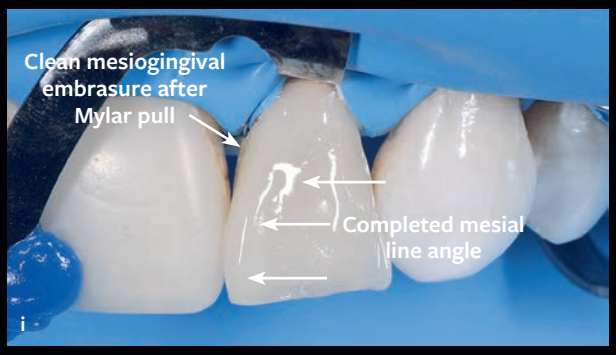


FIG 1-4 cont (*h to j*) The mesial and distal line angles are important and distinctive features of incisors. They determine the visual mesiodistal width of a tooth. A predictable way of developing them is to use the Mylar pull technique, shown in these photos. (*k*) The final facial layer is placed between the line angles. An artist brush with wetting resin can be used to help blend in the layers and complete the restoration with a smooth surface. The same brush with minor pressure can be used to add developmental grooves. (*l and m*) The restoration is ready for finishing and polishing.

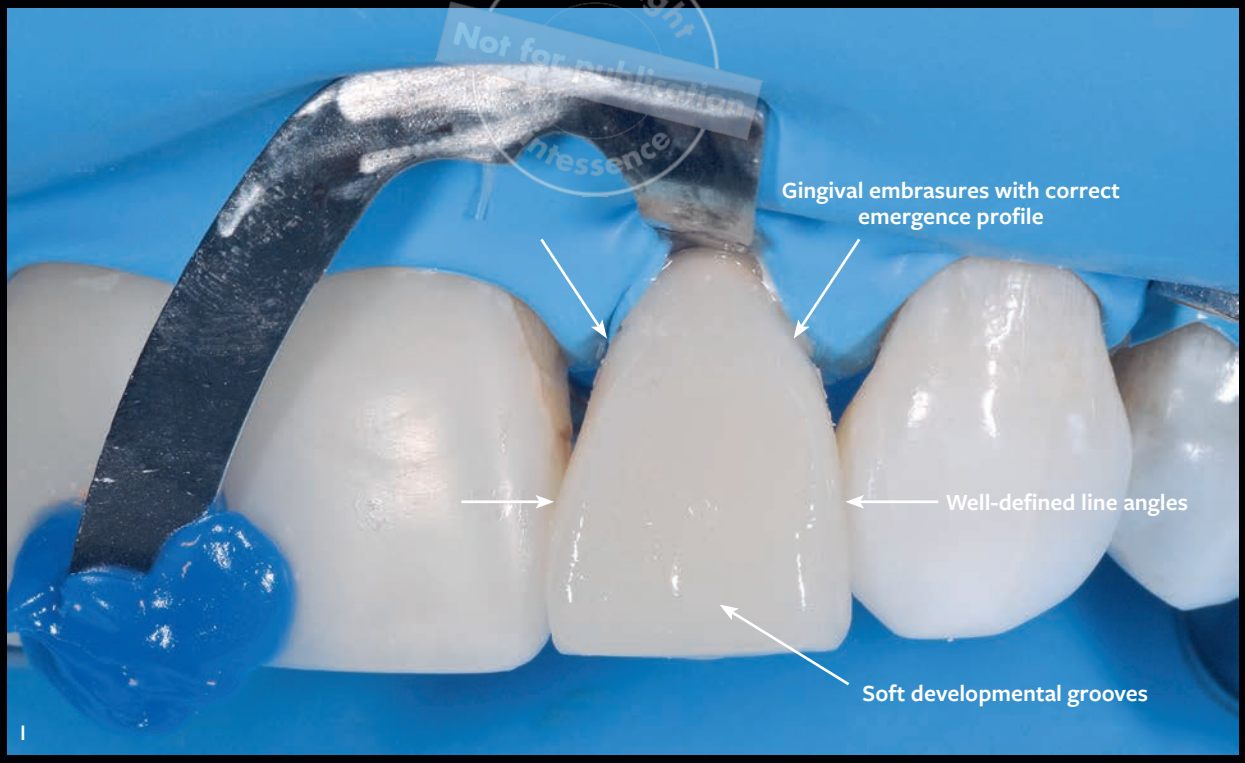


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FIG 1-5 (*a*) Immediately after finishing and polishing of the fiber-reinforced direct composite restoration. (*b*) Clinical view at the 21-month follow-up.

Figure 1-5 shows the results of this case. The 21-month follow-up revealed biointegration of the large direct composite restoration with the surrounding teeth as well as excellent gingival health.

MINIMAL INTERVENTION DENTISTRY

From a conceptual standpoint, minimal intervention dentistry is a philosophy that attempts to ensure that teeth are kept functional for life. According to Frencken et al,[2] this concept is not limited to treating dental caries but should also extend to periodontology, oral rehabilitation, oral surgery, and esthetic dentistry. It is unacceptable that, in the name of "minimally invasive esthetic dentistry," a single dark central incisor with no previous restorations should have its enamel reduced and a ceramic veneer bonded to it when the most conservative alternative is simply bleaching it with 10% carbamide peroxide.

In the same way, teeth that are weakened due to the loss of dental tissues can be structurally restored by direct or indirect means by following strict bonding protocols. These protocols include the following: (*1*) ideal rubber dam isolation and control of the operative field, (*2*) selective caries removal that does not compromise the vitality of the tooth but that allows for a clean peripheral seal of 1.5 mm from the dentin-enamel junction, (*3*) selection of the best bonding strategy that will create a strong and durable hybrid layer, (*4*) use of filled flowable composite resin as the first layer to allow for maturation of the hybrid layer for at least 3 to 4 minutes prior to light curing, and (*5*) building the tooth using stress-reducing protocols that combine centripetal cusp buildup and fiber reinforcement, which help produce low stress on the fresh hybrid layer. All these steps are supported by years of evidence. Adhesive dentistry is not easy, but when done correctly, it can be used to restore teeth and keep them in function for years to come.

Patients benefit in other ways from minimally invasive dentistry as well. Weiner et al[3] looked into the fears and concerns of individuals contemplating esthetic restorative procedures like veneers, crowns, and implants and found that almost 60% of patients had marked or severe anxiety or would avoid treatment completely simply because they were worried that the results would look unnatural or false and that the provider would not redo treatment if they were dissatisfied with the outcome. These fears may be caused by lack of good communication from the provider at the time of treatment planning. How many providers go through a full set of photos, mounted casts, diagnostic wax-ups, and smile prototypes prior to initiating final preparations and delivery? How many providers set aside additional time to show patients other similar cases they have worked on and the outcomes they obtained? In many dental practices, treatment plans are developed and discussed with the patient chairside during the first appointment. Remember that patients often have a complete lack of understanding about the complexities of esthetic restorative dentistry.

Other important factors to consider are the sources of patient fears reported in the literature. In order of importance, the sources of patient fears are (*1*) the drill, (*2*) the dental injection, (*3*) prior trauma, and (*4*) past dental experiences, all of which keep patients away from the dental office. This group of patients would benefit from less invasive forms of esthetic dentistry that don't require a drill or a dental injection. Many of these patients have what I consider an acceptable smile. It may not be a "perfect" smile, but it is one that can be enhanced with simple and noninvasive procedures like bleaching, microabrasion, or resin infiltration. The dentist/patient relationship will develop during these initial procedures, allowing for better communication and trust that can pave the way for future esthetic treatments and referrals.

Another benefit of these simple procedures is that even if additional restorative procedures are needed to improve the esthetics of a smile, they will involve fewer teeth. A survey completed by members of the American Academy of Esthetic Dentistry shows that 33% of the surveyed members view overtreatment as the biggest threat to esthetic dentistry today.[4] More invasive procedures result in patient anxiety; restorations that can fracture, stain, and cause gingival inflammation;

and higher costs for the patient. Too many times we see reports in dental journals about patients treated with 10 to 12 porcelain veneers just because they had a maxillary midline diastema and slightly rotated lateral incisors. Wouldn't orthodontic treatment be a better and more conservative option? How many times have we seen a central incisor with a large Class IV fracture and the patient ending up with two porcelain veneers or crowns? A single-layered direct composite restoration would be the most conservative option.

Let's not forget to value the most beautiful tissue God gave our teeth—enamel. Once it is removed, there is no turning back. Minimally invasive dentistry is for those of us who understand that our God-given enamel will never fail, even on not so "perfect" smiles, whereas even the most beautiful and artistic porcelain veneers will eventually fail the test of time.

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CLINICAL RECOMMENDATIONS BASED ON EXPERIENCE

- Keeping teeth intact for life is the ultimate goal of minimally invasive dentistry.
- Lack of good communication creates patient anxiety and lack of trust.
- Patients who are afraid of the dentist may benefit from less invasive treatment options.
- Overtreatment is recognized as a problem in our profession.
- Overtreatment increases patient cost and contributes to future dental problems.

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