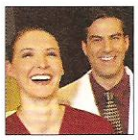
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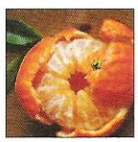

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# Tetracycline Veneers: A Case Report



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One of the most difficult esthetic procedures in dentistry can be the improvement in appearance of tetracycline stained teeth. Trying to achieve the optimal hue, chroma, value, and translucency has been attempted by clinicians using techniques such as enamel microabrasion, bleaching procedures, and laminate veneers. Complicating the various clinical techniques is tetracycline stained teeth's inability to absorb and reflect light like a nontetracycline stained tooth.[1]

When dealing with light transmission, there are 3 things that can happen when light hits an object. When the object is transparent, all the light is able to pass through the object. Conversely, when an object is opaque, no light is able to pass through. Translucency deals with the percentage of light that is able to pass through the object. As an example, the more translucent an object is the more light that is able to pass through.[2,3]

The degree of tetracycline staining is directly proportional to the amount of light that can pass through the tooth. The heavier the tetracycline staining, the less light that can pass through, making the tooth less transparent or more opaque. These characteristics cause the tetracycline stained tooth to act like a porcelain-fused-to-metal crown, making natural esthetics difficult to achieve.

In addition to the color, the clinician must also take into account golden proportions and smile design.[4-6] These must be discussed candidly with the patient, but the clinician must not to try to influence what it is that the patient wants.

The following case is an example of these principles and how one might approach a similar case to achieve a desirable esthetic result.

## Case Report

A 42-year-old woman (Figure 1) presented for a consultation to evaluate the possibility of placing porcelain veneers on her maxillary teeth Nos. 4 through 13. Teeth Nos. 5 through 11 had old direct and indirect resins on the facial surfaces that were badly discolored and broken down with numerous repairs made (Figure 2). Teeth Nos. 4, 5, 12, and 13 also had mesio-occlusal distal resins that were breaking down and in need of replacement (Figure 3). Teeth Nos. 3 and 14 also had an older type of composite restoration that the patient wanted to replace at a later date.

The patient's medical history was uneventful and her oral hygiene and periodontal status was very good and stable. She had no complaints of any temporomandibular joint symptoms after a thorough evaluation, but clinically, and after observing her models, it was obvious that the patient had some signs of occlusal pathology.

After addressing the occlusion concerns, the patient agreed to have an anatomical removable orthosis made from a TENS (transcutaneous electrical neural stimulation) bite after her final restorations were delivered. This would provide the patient with a better centric reference position for protection against potential parafunctional habits.

After discussing with the patient the pros and cons of porcelain veneers



**Figure 1**—Preoperative facial view.



**Figure 2**—Preoperative retracted view.

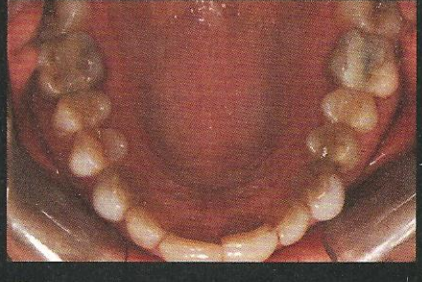


**Figure 3**—Preoperative occlusal view.

and addressing candidly the realistic results that could be expected, she was ready to begin treatment.

Radiographs, polyvinyl siloxane impressions, and a bite registration were taken and sent to the lab for a wax up to be made, which was used as a template for her temporaries and final restorations.[7,8] This would allow the patient to go on a trial run with temporaries made from the wax-up. If there were any changes to be made, the temporaries could be adjusted and an impression could be taken of the changes so that the lab could make the appropriate changes in the final restorations.

Upon return from the lab, the wax-up was reviewed with the patient and she was ready to begin treatment. The form of the patient's existing arch needed minor correction with teeth Nos. 9 through 11. Both teeth Nos. 9 and 10 were lingually inverted and No. 11 was facially positioned. The wax-up was able to correct these malaligned teeth and they were prepared to compensate for the deviations (Figure 4). Shape, color, and size were reviewed and realistic expectations were candidly discussed as they related to difficulty in working with the innate qualities of tetracycline-stained teeth. The patient chose an enhanced shape (LVI smile catalogue) using the golden proportions as a guide. The color chosen was 020,030 from the Empress Chromoscope shade guide (Ivoclar Vivadent).

When looking at the patient's maxillary anterior teeth, according to the golden proportion numbers, the width of the laterals will be a factor of 1. The centrals will be 1.6 times wider than the laterals and the canines will be 0.6 times the width of the laterals. These measurements are not set in stone but act as a guideline for producing an esthetic result that is pleasing to the eye.

Smile design was also taken into consideration. The midline, axial inclination, lip line, incisal edges and phonetics, interproximal contacts, gradation, gingival symmetry, gingival contour, and zenith were all taken into consideration when designing the case from preoperative models, wax-up, temporaries, and final restorations.[4,9,10] Although it was a given before we started this case that we would not be able to achieve the perfect smile design, the intent was to design a natural symmetry by improving tissue contour.

On tooth preparation day, the wax-up, color choices, and any concerns the patient had were reviewed and discussed. All instruments, materials, and supplies were out and ready to use to help facilitate the efficiency and speed of the procedure. A simple checklist was used to keep the clinician on track, eliminate mistakes, and improve the information provided to the lab.

To manage the bite and maintain centric stops during the course of the preparation, a preoperative hard-bite (LuxaBite, Zenith/DMG) was taken before anesthetic was given. The patient was anesthetized, an OptraGate (Ivoclar Vivadent) was placed to aid in lip retraction, and a diode laser (HoyaConBio) was used to improve tissue symmetry and contour. An incisal guide stent was then tried in to aide the clinician in visualizing and preparing the wax-up.

One mistake commonly encountered by the author and observed by dental laboratories is the over- or underpreparing of teeth in the wrong dimension facially, lingually, incisally, mesially, and distally. This can ultimately affect the arch form by allowing for too thick of a restoration facially or lingually and affect the laboratory's ability to create a natural golden proportion. With an incisal guide stent, the clinician can prepare the case to the wax-up to give the laboratory the ideal arch form, base, and golden proportions to build the case from. In this case, the preparation of the teeth began with slice prepping the anterior

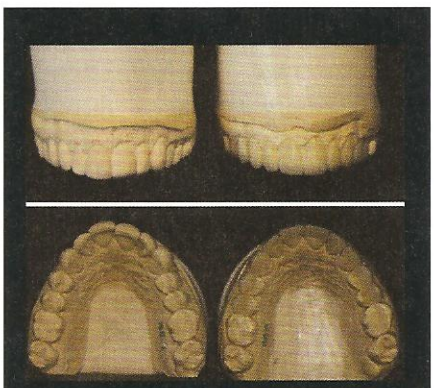


**Figure 4**—Preoperative models and wax-up showing changes in size, shape, golden proportions, and arch form.

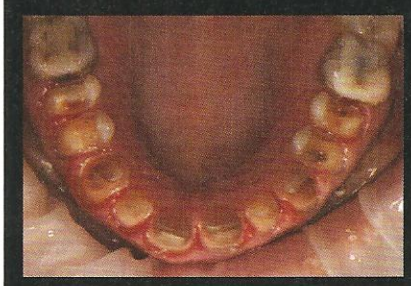


**Figure 5**—Final preparations.

to allow the laboratory the room to create a natural esthetic symmetry.

The incisal guide stent made from the wax-up was tried in to evaluate if the clinician had made the proper facial, incisal, and interproximal reduction. Adjustments were made and the initial bite was relined to maintain centric stops in 6 dimensions. The final preparations were evaluated, smoothed, and contoured, and a final check compared the incisal length of the wax-up and the prepared centrals to ensure proper incisal reduction. Note that the lingual cusps of all 4 premolars were kept intact to allow for the preservation of tooth structure (Figure 5).

Full-coverage crowns aren't always necessary as long as there is adequate healthy tooth structure to bond to and the occlusion is stable.[11-15] An impression was taken with Take 1 (Kerr Corporation) fast-set medium body and wash and inspected for marginal integrity, distortion, and voids near margins. It is important to use like materials with the same setting time to eliminate delamination of the wash and medium body materials.

Before the preparations were to be temporized, stump shades and pictures were taken and sent with the case to the laboratory. Stump shades allow the laboratory to build the veneers/crowns on the same color of the underlying tooth structure. This allows for a more natural and predictable final restoration and a better cervical blend at the marginal area. A symmetry bite was taken with a John Kois Facial Plane analyzer (Panadent Corp) to correct/confirm any midline or cant issues.

The temporary stent made from the wax-up was tried into place to get a feel for the fit and removal. A midline/frenum mark was inscribed on the stent with an instrument to give the clinician a reference point when the stent was filled with temporary material. A desensitizer with fluoride (Aquasil, Dentsply Caulk) was coated copiously on the prepared teeth and lightly desiccated.

The stent was then filled with the temporary material B1 shade (LuxaTemp, Zenith/DMG), being careful not to lift the tip of the dispenser out of the material to avoid air bubbles. As soon as the stent was filled, it was tapped 2 to 3 times on a hard surface to bring any air bubbles to the surface before placement into the patient's mouth. The temporary material was allowed to set for 2.5 minutes and was then removed by pulling one side out and around while holding the other side firmly in place. The intent was to allow the material to stay on the prepared teeth and polymerize (shrink wrap) to allow for proper retention. The temporaries were trimmed for excess, contoured, a flowable B1 resin (LuxaFlow, Zenith/DMG) was added where air bubbles and voids were present, and light-cured.

After adjusting the occlusion and polishing the temporaries, a light-cured varnish (LuxaGlaze, Zenith/DMG) was applied with a brush and light-cured. The patient was pleased with the temporaries but it was at this time that the clinician noted that the cervical tissue discrepancy on tooth No. 8 might be a challenge. The patient was advised of this and prepared to make a change if necessary at the delivery appointment.

The patient was called in the interim to check on comfort, color, and shape and reported little discomfort. The restorations were fabricated and sent back to the clinician for evaluation of color, contour, and marginal fit. Because of the tissue and bone asymmetry on tooth No. 8 as compared to No. 9, it was decided to seat all the restorations except for Nos. 8 and 9.

After evaluating the bone and sulcular depth, it was decided that another 1.0 mm of tooth length could be obtained by raising the tissue level of tooth No. 8 by 1.0 mm and repreparing

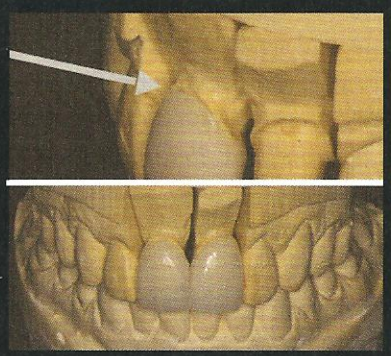


**Figure 6**—Original veneer shown on newly prepped model showing 1.0 mm marginal discrepancy on tooth No. 8 with tooth No. 9 fitting beautifully.




**Figure 7**—Armamentarium of critical materials.

the cervical marginal area and to gain better tissue symmetry. The clinician was limited in raising the tissue level 1.0 mm because of the possibility of invading the biologic width. The possibility of achieving the perfect result was limited by the osseous level and because the patient did not want to undergo osseous surgery. An osseous laser venue was not available.

The patient was ready for delivery of the restorations. After the patient was anesthetized, the temporaries were removed, the teeth were cleaned up with hydrogen peroxide, and the tissue was evaluated for irritation. The restorations were tried in for fit, marginal adaptation, contour, and color. Yellow try-in paste was used on teeth Nos. 6 through 8, and a translucent try-in paste was used on teeth Nos. 9 through 11. The patient was not informed which side the yellow or translucent try-in paste was used on. This allows the patient to see the difference (if any) and make an objective decision to their liking. While the difference in try-in paste might only give a 10% to 20% change in hue, chroma, and value, the author feels that is enough of a difference that it should be explored at the try-in of the final restorations. The author has found that in cases where the value is off slightly, a yellow hue can give the restoration a warmth by raising the value and lowering the chroma.

All the restorations were removed and the try-in paste was rinsed out. The restorations were then dried and re-etched with 37% phosphoric acid to clean out and re-acidify the internal aspect of the restorations.[1] The restorations were then laid out on a clean medium in the order that they would be placed in the mouth and were silanated with Kerr Silane Primer (Kerr Corporation).[2] This material is unique in that it not only silanates the internal aspect of the restorations, but also coats it with a layer of unfilled resin. This eliminates having to coat with a silanating material and then placing another coat of unfilled resin.

A rubber dam was placed for moisture control and to prevent any bacterial contamination that might occur. Because teeth Nos. 8 and 9 would not be seated, the restorations were seated in the opposite order starting in the posterior and working toward the anterior. Usually the anterior restorations are seated first because they are the focal point. If the centrals are off the slightest amount, it will cause a domino effect in the placement and seating of the entire case. Starting with the most posterior, the teeth were etched for 15 to 20 seconds, 3 to 4 teeth at a time starting at the most distal and moving mesially, then rinsed with water.

With great hygiene and good fitting temporaries, irritated tissue was kept to a minimum. When needed, the author used ViscoStat (UltraDent) to spot control hemorrhaging. All the teeth were coated with Aquasil to rewet the dental surface and 3 to 4 coats of OptiBond Solo Plus (Kerr Corporation) were used to prime the dentinal surface. The primer was air thinned and any excess pooling was meticulously removed with a multibrush. The primer was then light-cured with an LED curing light (Blue Phase, Ivoclar Vivadent).

The teeth were then ready to have the restorations bonded into place. Because teeth Nos. 8 and 9 were not going to be placed, the restorations were bonded into place 2 at a time starting at the most posterior and

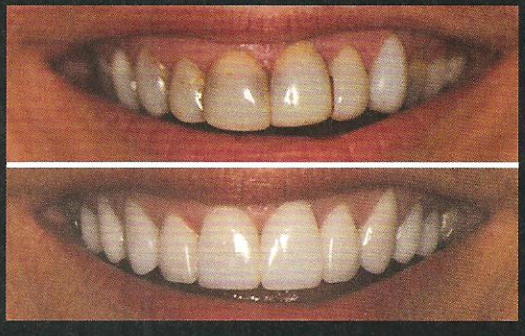


**Figure 8**—Pre- and postoperative smile views.

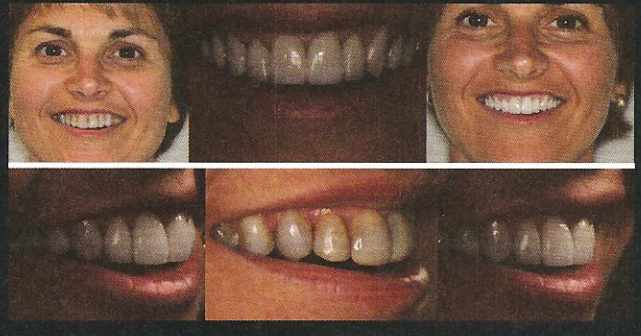


**Figure 9**—Pre- and postoperative facial, right, left, and smile views.

working anteriorly. Nexus 2 yellow shade base (Kerr Corporation) was used to bond the restorations into place. The author does not advocate using a catalyst with the base when bonding veneers into place because of the possibility of a premature setting of the resin cement before the clinician is ready to spot tack the restoration. After the first 2 posterior restorations were spot tacked, all the excess resin was carefully cleaned off with a brush and the proximal contacts were lightly flossed before the final cure. This sequence is followed 2 teeth at a time moving anteriorly and alternating right and left. In a normal case where all the restorations are placed at the same time, the author would start with the 2 centrals then place the laterals and canines right and left. The premolars were dry seated when the laterals and canines were spot tacked and bonded into place to maintain their space and then were seated last, allowing for any proximal adjustments to be done in a nonesthetic zone.

When all the restorations were in place, except for teeth Nos. 8 and 9, tissue contouring and marginal reprepping at the cervical only of tooth No. 8 was performed and a new impression was taken. The teeth were then rewetted with Aquasil and ready to be temporized. The advantage of having the patient codesign the color and shape of the teeth and communicate this information to a laboratory is that the laboratory can create a wax-up that will mimic the design the patient chose and should be extremely similar to the final restorations if no adjustments or changes were made. It was because of this that the author used the original temporary stent used for the original temporaries and made a cut between the laterals and canines on both the right and left sides to allow for positive stops.

The stent was tried in to allow the clinician to see how it feels upon insertion. This new 2 tooth temporary stent was then filled with LuxaTemp shade B1 and placed over teeth Nos. 8 and 9 for 2.5 minutes before removing, cleaning, and contouring. The occlusion was checked and the final glaze was placed with a brush and light-cured.

The final restorations and the temporaries on teeth Nos. 8 and 9 were checked to determine if the corrections that were made were successful and that, more importantly, the patient was happy with the results. The adjustments that were made did not make it the perfect tissue and marginal symmetry, but it did improve the appearance and created a natural symmetry that looked pleasing to the eye in the patient's and author's opinion. The patient and author both felt that this decision was worth the extra time and effort in improving the final outcome.

The patient was instructed to continue with her excellent hygiene and came in for her return visit with great fitting temporaries and excellent tissue health. The final 2 restorations came back from the lab and were tried on the models to confirm fit, contour, and color. The original restorations were tried on the newly prepared dies to observe the cervical changes made on tooth No. 8 only. The fit of tooth No. 8 confirmed what was achieved clinically showing a 1.0 mm discrepancy at the cervical margin and tooth No. 9 fit beautifully (Figure 6).

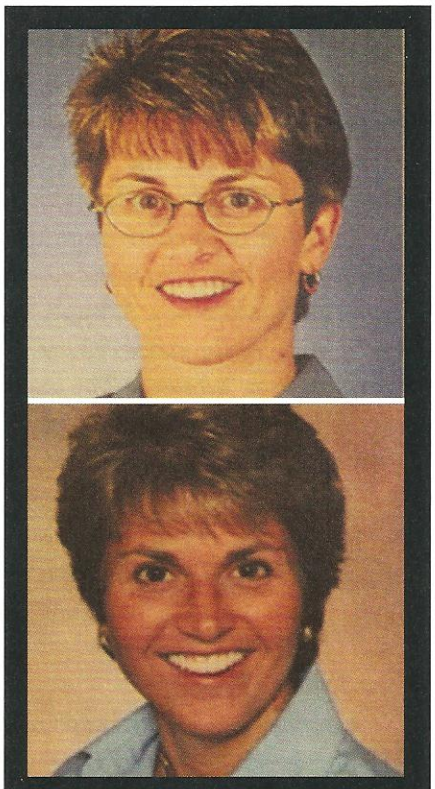


**Figure 10**—Patient's new business card showing a life changing smile makeover and drastically improved self-esteem as evidenced by a more natural appearing and proud smile.

The patient was anesthetized, the temporaries were removed, and the teeth were cleaned with hydrogen peroxide. The author's armamentarium was organized and ready for the try-in of the 2 new restorations (Figure 7). The centrals were tried in and checked for color, fit, and contour. Nexus 2 yellow try-in paste was used to verify color blend and the centrals were removed and the temporary paste was rinsed out of the restorations and dried. A 37.5% phosphoric acid (Kerr Corporation) was used to clean and acidify the internal aspect of the restorations before they were silanated (Kerr Silane Primer) and ready to be permanently bonded into place. A

rubber dam was placed and the teeth were cleaned and etched with 37.5% phosphoric acid and rinsed and lightly desiccated. Aquasil was then used as a rewetting agent and the teeth were primed with OptiBond Solo Plus.

The final restorations were filled with Nexus 2 base yellow, seated, and spot tacked into place. A brush was used to clean up the excess cement and final cure was achieved. The excess cement was carefully cleaned off the interproximal contacts and floss was used to verify a smooth interproximal surface. The occlusion was checked and a final polish was achieved to finish the case (Figures 8 through 10).

## Conclusion

Achieving perfection is the ultimate goal of any esthetic dentist. The reality of achieving this perfection with every case is not always feasible or realistic. This case demonstrates how to deal with numerous challenges from color, shape, tissue contour, and symmetry. It is important to note that communication with the patient and laboratory are particularly critical when presented with a challenging case. The patient must be made aware of the inherent problems and that absolute perfection is probably not a realistic possibility.

## Acknowledgment

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