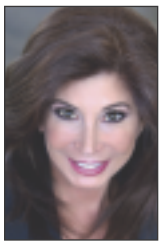
To Plan or Not to Plan: That Is the Question!

Aesthetically Guided Transitional Bonding for Space Management Quandaries



Joyce Bassett, DDS

Figures 1a to 1c. Preoperative view, banded.

INTRODUCTION

Have you ever walked into a hygiene exam check to find your orthodontically banded patient anxiously waiting for an answer? "When?" the patient demands; "How many more minutes?" A letter from the orthodontist asks if spacing is appropriate between the canines and the centrals. The letter requests explicit direction on tooth movement or permission to deband.

Your immediate reaction is, "I don't know!" The patient's teeth do not fill the existing space, they are contralaterally dissimilar, and you are responsible for setting up the case so the restorative phase is both functionally and aesthetically predictable. The patient wants the brackets off yesterday. What do you do?

Many restorative dentists have worked on patients who were debanded but whose existing dentition had not been orthodontically structured to allow for contralateral symmetry in the final reconstruction. Usually the restoring dentist does not recognize this until he or she bonds the spaces closed, filling in whatever space remains after orthodontic treatment. It then becomes clear that the spaces were not equalized, leading to asymmetry of the contralateral teeth, an unattractive and unequalized smile, and a dissatisfied dentist and patient.

Today, however, we have the ability to preplan these complex situations and better satisfy our patients. The composite bonding technique I describe in the following article will serve as a predictable, functional, and aesthetic solution to these complex situations. The article will review the parameters for anterior tooth positioning, proportions, contours, and techniques to predictably manage space management dilemmas.

CASE REPORT

Diagnosis and Treatment Planning

A 14.5-year-old female patient presented with fully banded upper and lower arches as part of orthodontic treatment to align and straighten her teeth and bite (Figures 1a to 1c). Her gingival zenith and tissue appeared healthy and symmetrical. Her dentition was caries free with no wear. She was healthy and had no significant medical history.

Transitional orthodontic bonding was prescribed as part of a multidisciplinary approach to improve aesthetics. She demonstrated diastemas in the smile zone, with teeth Nos. 6 to 8 and 9 to 11 being separated by gaps. The lateral incisors were irregularly shaped, asymmetrical, and narrow (Figure 2). The patient presented to the orthodontist as a 13-year-old female 18 months prior with a Class II division II malocclusion and a significant tooth size discrepancy, primarily between the upper lateral incisors. The orthodontist, in the past 18 months, had reduced the overbite and overjet and had obtained an ideal posterior occlusion. The central incisors were aligned so the roots were parallel, and the centrals were at the midline of the face and perpendicular to the interpupillary line.[1]

The dental midline runs vertically from the nasion subnasal point, interincisal point, to the pogonion. Ideally the papilla between the maxillary central incisors coincides with the midline of the face. In research conducted by Miller et al[2], it was shown that 70% of the time, the maxillary midline coincided with the facial midline when the lip's philtrum was used as a reference point. It is more important to have the dental midline perpendicular to the interpupillary line and straight; this allows for symmetry. The occlusal line should conform to the commissural line. In this case, the orthodontist placed the centrals' incisal edges in close relationship following the curvature of the lower lip, which has also been called the smile-line.[3] The upper lip contour and movement can vary considerably. The lateral incisors' edges were placed

continued on page 130

Today, however, we have the ability to preplan these complex situations and better satisfy our patients.

To Plan or Not to Plan...

continued from page 128

at a distance of 0.5 to 1.5 mm from the lower lip. A space was created mesial and distal to the lateral incisors, ensuring that adequate spacing was provided to allow for functionally strong and visually appealing composite placement.

With the above parameters accomplished, the brackets were removed from Nos. 6 to 11, and we were ready to restore.

In consultation with the patient and her parents, we developed a treatment plan that would utilize transitional bonding and attempt to close the diastemas and correct the contralateral asymmetry found in the upper arch. The goal was to create 2 lateral incisors with ideal size and shape following the golden rule of proportion. Once this was accomplished, the brackets would be replaced; any residual spaces would be closed orthodontically.

The most influential factors in a harmonious, balanced anterior dentition are the size, shape, and position of the maxillary incisors;[1] it is therefore paramount that they are contralaterally identical to each other. The width of a central incisor should measure approximately 70% to 80% of its length. Evaluation of the central incisors' mesiodistal widths, incisal architecture, and embrasures revealed asymmetry.

Measurements with a Dentagauge digital caliper (Erskine Dental International) revealed that the right central (8.5 mm wide) was thinner by 0.5 mm than the left central incisor (9.0 mm wide) (Figure 3). The distal incisal corner was also curvier and its embrasure more open, with the incisal edge slanted apically toward the distal. The right central incisor would require composite bonding on the distal to equalize the width and provide symmetry.

Figure 2. Preoperative frontal view of teeth Nos. 6 to 11. *Note irregularly shaped and narrow lateral incisors.*

Figure 3. The right central was thinner by 0.5 mm than the left central incisor.

Figure 4. Composite bonding on the distal of the right central to equalize the width and provide symmetry.

Figure 5. Measuring the mesiodistal widths of teeth Nos. 7 and 10; note that they are different.

Figure 6. Etching of tooth No. 7 showing where composite will be applied.

Figure 7. A diamond bur (No. 8889-009 [Brasseler USA]) was used to contour the mesial facial embrasure of No. 7.

Figure 8. Removing the aprismatic enamel on the mesial of tooth No. 10 (left lateral) with the 8889-009 bur.

Figure 9. Microetching (Micro Etcher II [Danville Materials]) the mesial of tooth No. 10 using with a 60°-rounded 0.032-µm nozzle aluminum oxide 27-µm white.

Figure 10. Finalizing width and verifying contralateral symmetry.

Preparation and Composite Placement

A universal nanocomposite resin (Filtek Supreme Ultra [3M ESPE]) composite resin was selected for the transitional bonding due to its strength, sculptability, and shade-matching capabilities. A microfilled composite resin (Durafil [Heraeus Kulzer]) was chosen as the thinnest final facial layer; its silica particles are .04 µm in size, with the filler being 35% of the weight. This microfilled composite is translucent and provides excellent polishability and long-term color retention to the final restoration.[4] The treatment plan was to deband, perform transitional bonding, and reband within 3 days. Fortunately, the patient was satisfied with the present color of her dentition, as time did not allow for whitening procedures.

Extrinsic stain was removed from debanded tooth surfaces using plain pumice on a soft prophy cup. Shade selection should be performed immediately, as the tooth will have otherwise desiccated and lightened after the bonding protocol, leading to an incorrect match. The center body portion of the tooth was examined and matched to the VITA Vitapan (Vident) tooth shade guide, and a composite body shade was selected that matches this portion.

It is important to discuss the level of aesthetics the patient requires in the final restoration. If the patient has low expectations and a monochromatic tooth, the case can be completed using one body shade.[5] In this case, the depth of color and vitality needed to mimic the adjacent tooth was simple and required Filtek Supreme Ultra shade A1B on the body of the tooth and WE on the incisal corner. When applied as a thin, final facial layer, Durafil VS in shade A1 will modulate the color and allow color depth to come from within the restoration. Experimenting with these different shades and thickness of composite by placing them in the planned area of the tooth and curing them allows the dentist a preview. This is a technique that provides predictability in color mapping and can aid in designing an imperceptible restoration.

The patient was fully retracted during the bonding procedure, and the protocol for teeth Nos. 7 to 9 was unchanged: Aprismatic enamel was removed using Brasseler USA diamond 8889-009 and by roughening the tooth lightly with a pendulumlike movement. The distal incisal surface of tooth No. 8 was microetched (Micro Etcher II [Danville Materials]) with a 60° rounded 0.032 µm nozzle aluminum oxide 27 µm white, and rinsed 5 seconds. Total-etch techniques have been shown to provide predictable shear bond strength to enamel of 18 to 30 MPa. The patient was then acid-etched with 35% phosphoric acid (Heraeus Kulzer) for 15 seconds with agitation, rinsed for 5 seconds, and blotted dry. We then applied 2 to 3 coats of a one-step bonding agent (Adper Single Bond Plus Adhesive [3M ESPE]); lightly air-drying, and then light-curing for 10 seconds. Composite resin was sculpted using an 8A composite placement instrument (Cosmedent) and a contouring gold instrument (Almore International). The composite was contoured, and when visual symmetry was attained, the composite was light-cured for 20 seconds (Figure 4). The 2 centrals were grossly finished and measured to ensure that identical, contralateral shapes existed.

Beauty is connected to numerical values, and Pythagoras' Theory of Golden Proportion is considered a mathematical tool for determining dominance and proportion in arranging the maxillary teeth from the frontal view. Ideal width-to-length

Figure 11. One day postoperative: finalizing shapes and shade matching before brackets are reapplied and canines are moved anteriorly to close remaining spaces.

Figure 12. Final postoperative view after debanding of orthodontic brackets. Note the symmetry, balance, and harmony, and seamless undetectable composite restorations.

ratios for central incisors, referred to as the Golden Rule of Proportions, should be used a guide when reconstructing the lateral incisors.[1] These rules were applied to the apparent size, as viewed directly from the anterior. Lombardi[6] states that the Golden Proportion has proven too rigid for dentistry. Excessive narrowness of the maxillary arch can be observed in situations of strict adherence to the Golden Rule. Aesthetic display has been driven to include widened buccal corridors, which would drive the anterior teeth in a wider direction. The ratios between the widths of the incisors should be 1.618 for the centrals to one for the laterals and 0.618 for the canines.

The mesiodistal widths of tooth teeth Nos. 7 and 10 (Figure 5) were different and required augmentation with composite. Using the Golden Rule of Proportion as a guide, the laterals should be 5.4 mm wide (5.4 x 1.68 = 9 mm, the widths of teeth Nos. 8 and 9). Magne et al[3] has shown the widest crowns were those of central (9.0 mm) and lateral incisors (7.0 mm).[2] The central incisors in this case were 9 mm wide. If we use the Golden Rule of Proportion to create 5.4-mm wide lateral incisors, they would appear thin and disproportionate. The relative dimensions of teeth seem to be the most objective dental criteria within the aesthetic checklist; they can be controlled using line angles and special effects of tooth form to influence perceptions of symmetry, dominance, and proportion.[3]

When treating space management situations, parameters for anterior tooth positioning, proportions, contours, and techniques must be applied.

The anatomy of a lateral incisor shows a distinct contrast between facial-palatal surfaces. The perceived tooth width is highly influenced by shape and especially interincisal angles, which are opened to create a perception of narrowness. The width-to-height ratio is 75% to 80% for a lateral incisor.[7] Tooth shape and form range from square to ovoid to triangular. Due to these variations, the incisor shape to be restored must blend in harmoniously with existing dentition. A lateral incisor generally has a more rounded mesial incisal angle; however, laterals show the greatest variation in form when compared to all other teeth in the mouth. The transition line angle is prominent on the mesial and much softer on the distal.[7] The incisal effects and surface texture should mimic the existing dentition. The incisal edge configuration influences the negative space during laughter and mouth opening. Rounded incisal edges will compensate for teeth that are too large, and straight edges are indicated for incisors that are too narrow. These parameters are very subjective.

The identical bonding protocol that was described earlier on tooth No. 8 was performed on No. 7. The mesial and distal incisal spaces of No. 7 were etched (Figure 6) and adhesive was applied. A1B was positioned on both sides of the tooth in order to equalize the space, and a thin facial layer of Durafil was placed as a final facial layer over the A1B. After light-curing for 15 seconds, the Brasseler USA diamond was used to contour the facial and incisal embrasures (Figure 7). The width that was aesthetically pleasing was 7.0 mm; the incisal embrasures are a youthful *V* shape.

The bonding protocol that was described on teeth Nos. 7 and 8 was again performed on No. 10. Aprismatic enamel was removed using the Brasseler USA diamond (Figure 8), and the mesiodistal incisal surface of No. 10 was microetched (Figure 9) and rinsed for 5 seconds. The tooth was acid-etched for 15 seconds with agitation, rinsed for 5 seconds, and blotted dry. The adhesive bonding agent was applied in 2 to 3 coats, lightly air-dried, and light-cured for 10 seconds. Composite A1B was sculpted mesially and distally to equalize the tooth width and ensure symmetry to No. 7 by using the aforementioned composite placement instrument and contouring gold instrument. Durafil A1 was placed as the thinnest final facial layer over 7 and 10. Measurements of Nos. 7 and 10 verified that our composite placement had balanced the widths of these 2 teeth, brought them into proportion, and ensured contralateral symmetry (Figure 10).

Finishing and contouring was performed to ensure that proper anatomical contour and imperceptibility between the composite and the tooth interface was attained. Primary anatomy, which consists of the facial profile, outline form, and incisal embrasures, was refined by using a Sof-Lex Finishing and Polishing disc (3M ESPE) to give a final polish to bring about a lustrous, lifelike finish.

Postoperative Check

The patient and her parents returned for a postoperative visit one day after placement of her composite restorations. The size and contour of each tooth was verified for contralateral symmetry using a digital caliper (Dentagauge [Erskine Dental]). Refinement, finalization, and margination of the composite was performed; followed by a final polish with Enamelize (Cosmedent) aluminum oxide polishing paste on a FlexiBuff (Cosmedent) (Figure 11). Our clinical check confirmed contralateral symmetry, shade matching, and flawless margins between the patient's natural tooth and composite reconstruction. The teeth gave off a luminescent, lifelike appearance, and demonstrated indistinguishable restorations.

The transitional bonding, accomplished with a combination of a universal nanocomposite resin and a microfilled composite resin, will provide this patient a fully functional, aesthetically pleasing smile for years to come. With the patient's and her parents' final approval, she returned to the orthodontist's office for banding and closing of the remaining spaces distal to the lateral incisors by moving the canines mesially.

CONCLUSION

When treating space management situations, parameters for anterior tooth positioning, proportions, contours, and techniques must be applied. The final restorative result (Figure 12) demonstrated symmetry, balance, and harmony, as well as seamless, undetectable restorations. The advantages of using this technique are predictability in shape and form of the final results. Immediate fabrication of an Essex retainer can be accomplished at debanding, and the patient is happy with the final results.✦

Acknowledgement

The author thanks Dr. Bruce Goldstein (Scottsdale, Ariz) for foresight in planning the orthodontic alignment and guiding the timing of the transitional bonding.

References

1. Gürel G. *The Science and Art of Porcelain Laminate Veneers*. Hanover Park, IL: Quintessence Publishing; 2003:61, 80-83.
2. Miller EL, Bodden WR jr, Jamison HC. A Study of the relationship of the dental midline to the facial median line. *J Prosthet Dent*. 1979;41 (6):657-660.
3. Magne P, Gallucci GO, Belser UC. Anatomic crown width/length ratios of unworn and worn maxillary teeth in white subjects. *J Prosthet Dent*. 2003;89:453-461.
4. Margeas R. Composite resin: a versatile, multipurpose restorative material. *Compend Contin Educ Dent*. 2012;33:42-45.
5. Bassett J. Conservative restorations of a traumatically involved central incisor. *Compend Contin Educ Dent*. 2012;33:264-267.
6. Lombardi RE. The principles of visual perception and their clinical application to denture esthetics. *J Prosthet Dent*. 1973;29:358-382.
7. Magne P, Belser U. *Bonded Porcelain Restorations in the Anterior Dentition: A Biomimetic Approach.* Hanover Park, IL: Quintessence Publishing; 2002:66, 68, 76.

Dr. Bassett practices cosmetic and restorative dentistry in Scottsdale, Ariz. She has Fellowship in the AGD and is past president of the Arizona AGD. Dr. Bassett is an associate member of the American Academy of Esthetic Dentistry, an active member in the Academy of Fixed Prosthodontics, and a KOIS mentor. Dr. Bassett teaches the aesthetic continuum at the Arizona School of Dentistry and is the founder of Women Teaching Women Cosmetic Learning Facility. She is a recipient of the volunteer dentist of the year for Arizona CASS dental clinic, a member of the editorial board of several peer-reviewed publications and a published author in *PPAD*, *Inside Dentistry*, *Dental Economics*, *AGD Journal*, and *Compendium*. She can be reached at drmouthy@aol.com.

Disclosure: Dr. Bassett received honoraria from 3M ESPE for writing this article.