

Merging Orthodontics and Restorative Dentistry: An Integral Part of Esthetic Dentistry

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ABSTRACT

This article discusses the different approaches in treatment planning of patients who desire an esthetic and functional improvement of their dentition but are hesitant to sacrifice healthy tooth structure. Preservation of tooth structure, whenever possible, should be paramount to any practicing dentist. The importance of such an approach, as taught for so many years, appears to be fading away lately under the pressure of advertisements full of promises for quick esthetic solutions. Exploration of the link between orthodontic and conservative restoration, along with minor use of periodontal procedures, will give another perspective in solving the esthetic dilemma.

CLINICAL SIGNIFICANCE

Often underutilized, the combination of procedures such as orthodontics and composite bonding gives practicing clinicians conservative, predictable, esthetic, and functional results.

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INTRODUCTION

In today's world, the media often dictates the desirable appearance among which the smile plays an important part. Under the influence of such advertisements, patients seek these labeled smiles at their dentist's office. In trying to satisfy their clients' desires, clinicians often rush to offer an "instant smile" design without considering the long-term health and well-being of the patients.^{1,2} Namely, all-ceramic crowns and porcelain veneers (aggressively prepared) are used all too often to correct structural damage as well as orthodontic discrepancies at the

expense of healthy tooth structure and under the name of "instant orthodontics." Modalities such as orthodontic movement of the teeth along with resin bonding are conveniently skipped under the assumption that patients are not willing to wear braces. In all honesty, they have been softly suggested to take other avenues. Even in some of our dental tabloids in justification of a proposed treatment plan, authors briefly mention that the "patient has refused orthodontic treatment" and, as a solution, extensive restorative dentistry is recommended and later performed with significant financial

involvement. By spending time and discussing all of the positive and negative aspects of extensive restorative work, we should give the patient enough information so there will not be remorse at the end of the treatment.

It is true that modalities such as orthodontics and operative services cannot solve all problems. They, too, have their own shortcomings. The need for an interdisciplinary approach that involves other specialties such as prosthodontics, periodontics, oral surgery, and orthodontics is always present.^{3–5} Unfortunately, the use of direct

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Figure 1. Note the irregular occlusal plane and a discrepant smile line.



Figure 2. Midline shift and the upper left canine positioned too buccally.

resin restorations, enamel reshaping, and vital bleaching as parts of esthetic dentistry is largely neglected even though they can add value and lower the total cost of the treatment.

CASE REPORT

The patient presented is 52 years old. She was not happy with the appearance of her upper left canine and her overall smile (Figures 1 and 2). Her ability to finance extensive dental treatment was somewhat limited. Nonetheless, she was willing to explore other dental options if that meant preserving healthy tooth structure and bringing the cost of treatment to a level with which she was comfortable. She is healthy without compromising medical conditions. Clinically, the patient exhibits good oral hygiene. She is periodontal AAP Type II (American Academy of Periodontology). A few failing amalgam and composite restorations were noted in the mandible



Figure 3. Wear of the lower incisors indicative of a restricted path of closure.

arch and were planned to be restored accordingly (Figure 3). The patient was missing her upper right first premolar. As a consequence, the midline had shifted 4 mm to the right. Her upper right second bicuspid was in a crossbite and was rotated 180 degrees (Figures 4 and 5). Her overbite was 4 mm and her overjet was 2 mm. The TMJs were not tender to palpation although bilateral clicking existed upon opening. All upper and lower central incisors, along

with the maxillary second premolars and first molars, exhibited a Class I to Class II mobility. They also showed a moderate amount of enamel wear. Crack lines were visible on both maxillary central incisors. The patient was aware of occasional clenching, which she ascribed to stress associated with her work. She experienced frequent spells of headaches along with occasional pain/tenderness in her temples as well as in the occipital/neck area. Her anterior path of



Figure 4. Upper right second premolar is in a crossbite.



Figure 5. Upper dentition showing maxillary constriction that caused the upper left canine to be positioned too buccally.

closure was somewhat restricted and had contributed to the wear of both her upper and lower incisors. She had a moderate to high smile line. Upon careful analysis of the clinical data, the patient was presented with two different treatment options.

TREATMENT OPTIONS

The first option consisted of orthodontic treatment with the goal of bringing the arches into a more rounded (to allow a better esthetic outcome) and stable position (to make treatment more functionally predictable).⁶ Additionally, it included the placement of a few direct resin-bonded composite restorations as a relatively inexpensive transitional solution to make up for the lost tooth structure. The patient was made aware of the limitations of achieving an ideal result (midline shift) because of the missing upper right first premolar. Nonetheless, to make the midlines

coincide, the removal of her upper left first premolar would be necessary. Her choice was to keep the tooth and accept the limitation. She understood, too, that her direct composite restorations would need periodic repolishing over time to bring back the surface luster to the restorations.⁷

Treatment time would require 12 to 15 months to finish the case and would not involve any fixed prosthodontic services.

The second option consisted of reconstructing the entire posterior quadrants of either the upper or lower dentition, opening the OVD and improving the restricted path of the closure. To make the smile design more desirable and harmonious, all upper premolars along with the upper incisors would need porcelain veneers. This approach would broaden the smile and give the illusion of properly

angled teeth. The upper canines presented the greatest challenge, because of their rotated position. It was almost certain that the left canine would require intentional endodontic treatment in order to visually position the future full coverage restoration into proper alignment with the rest of the upper dentition (Figure 6).

The right canine was too rotated to receive a thin porcelain veneer. The amount of tooth reduction would be too great and would leave the majority of the bonding surface of the tooth in dentin. This would significantly compromise long-term bonding and would result in a poorer prognosis of the restoration. Therefore, a full coverage restoration was deemed necessary to bring this tooth into visual alignment with the rest of the teeth. Estimated time to finish the treatment was between 5 and 7 weeks. Significant



Figure 6. Black line shows future buccal position of the upper teeth.



Figure 7. Upper arch, after orthodontic treatment, showing the ideal alignment of the upper teeth.

tooth reduction and financial commitment would be needed for this approach.

After a thorough consultation and review of all options, the patient elected to pursue the first treatment option. The potential to remove composites in the future with minimal potential damage (should she desire to replace them with more definitive restorations such as porcelain veneers) helped to make her decision easier.

Orthodontic Treatment

All preoperative data were collected and orthodontic treatment was initiated. As there was moderate wear of the incisal edges of the upper incisors, brackets were placed, taking into consideration the future position of the gum line instead. As a result, the incisal edges were not going to be even at the end of the treatment.

The wire sequence started with “cat” wire 0.0175 inch (Ortho Organizers, Carlsbad, CA, USA) and progressed to a rectangular wire 0.19 × 0.25 inch. The great benefit of rounding out the arches is that the arch is expanded, creating spaces to better allow for optimal positioning of the malaligned teeth. In a case when expanding the arches is not enough to allow complete and ideal alignment of all teeth, proximal enamel stripping is indicated.

In this case, the upper left quadrant exhibited excessive intra-arch constriction such that the upper left canine largely stayed out of proper upper arch alignment. By stripping the interproximal aspects of the upper left bicuspids with a Quik-Strip (Axis Dental, Coppell, TX, USA), additional space was created. The upper left premolars were moved more distally, which also

opened the space for the upper left canine to be brought into alignment with the other teeth (Figure 7). In contrast to the upper jaw, the lower arch exhibited slight crowding in the anterior quadrant. Composite “ramps” were placed over the occlusal surfaces of the lower second premolars and the first and second molars to allow for rapid correction of the crossbite. This also allowed for more spaces between the arches and prevented frequent dislodgement of orthodontic brackets. As orthodontic treatment progressed, the “ramps” were gradually lowered and, at the end of the treatment, only a small amount of composite was left on the lower first molars and lower right second bicuspid. They would be removed during the replacement of the existing restorations. The wire sequence, along with minimal interproximal stripping of the incisors, was all that was needed to



Figure 8. Lower arch retained with bonded lingual bar.



Figure 9. Crossbite corrected.

achieve ideal tooth position in the lower arch.

A Hawley appliance (Great Lakes Orthodontics, Ltd., Tonawanda, NY, USA) was used as a retainer of choice for the upper arch. The patient was instructed to wear it for 18 out of 24 hours for the first 6 months and then to wear the appliance overnight for an extended period of time. Because of a tendency to relapse, the lower teeth were retained by a bonded lingual bar (Figure 8). It is interesting to note that, at the end of the orthodontic treatment, the patient reported complete absence of headaches and neck stiffness.⁸ At the end of the orthodontic treatment, it was obvious that some of the preexisting shortcomings (missing upper right first premolar and 180-degree rotated upper right second premolar) would prevent an ideal orthodontic outcome (Figure 9).

Although there is insufficient research data on which to base clinical practice on retention at present, the remaining restorative and periodontal part of the case was scheduled 4 months after the completion of active orthodontic treatment.⁹

Restorative Treatment

Before the restorative treatment was begun, vital teeth whitening was initiated. Whitening trays were fabricated from the final orthodontic models. Whitening was performed with Opalescence gel PF 10% (Ultradent, South Jordan, UT, USA) applied once a day for 2 hours for 7 days.¹⁰ The patient was instructed to wait 10 days after the last session of bleaching so that no adverse effects on enamel bonding would be encountered.^{11,12}

Along with vital bleaching, time was used to determine the

appropriate length of the central and lateral incisors. Analyzing the smile line and the relationship between incisal edges of the upper centrals and the lip in repose position, it appeared that adding 1 mm to the incisal edges was indicated to create the most appropriate proportion (8 mm width and 10 mm length) without compromising the width-to-length ratio (Figures 10 and 11). Studies have shown that the majority of the human population, regardless of gender, exhibits clinical crown length in excess of 10 to 11 mm for maxillary central incisors.¹³

Freehand direct resin restorations were used to compensate for the lost tooth structure along the incisal edges.¹⁴⁻¹⁶ Vit-L-escence, shade Pearl Frost (Ultradent) was used as a lingual layer that would prohibit complete light penetration through the restoration. It is a hybrid resin that adds to the



Figure 10. The incisal edges of the upper incisors and canines stayed uneven after orthodontic treatment.



Figure 11. The occlusal plane is corrected after orthodontic treatment.

structural strength of the final restoration. The middle layer, a microfill resin, Durafill VS Shade OA2, (Heraeus Kultzer GmbH, Hanau, Germany) was used to make up for the missing dentin.

Because of the excellent polishing properties, microfill resin, Durafill VS Shade A1 (Heraeus Kultzer GmbH) served as the final outer enamel layer. After creating appropriate shapes and contours of the restorations, the final polishing took place. The Sof-Lex XT Pop-On Discs (3M ESPE, St. Paul, MN, USA) were used in the sequence recommended by the manufacturer. After the central and lateral incisors were finished, slight enameloplasty was performed on the upper left canine to reduce the pointedness of the incisal contour (Figure 12). The upper left premolars did not need any additional correction



Figure 12. Note the positive smile line and even incisal edges after finishing the case.

(Figure 13). The upper right side posed a greater challenge. Even though the upper second premolar was taken out of crossbite, it remained an esthetic problem. A 4-mm discrepancy of the gingival margins between the second premolar and the upper right canine remained. In addition, the emergence profile of the right bicuspid, because of the rotated position, was not favorable. Sounding the buccal

bone crest over the upper second premolar and finding that it was 5 mm from the free gingival margin, it was determined that there was only 2 mm of the gingival tissue that could be conservatively removed without the violation of the biologic width.^{17,18} Gingival recontouring was achieved using an electrosurge unit (Macan Engineering and Manufacturing Comp, Chicago, IL, USA).



Figure 13. Gingival harmony and ideal position of teeth on the upper left side.



Figure 14. Gingival improvement of the upper right side.



Figure 15. Improved alignment and corrected incisal edges of the upper teeth.



Figure 16. Corrected anterior crowding and remnants of composite "ramps" left after orthodontic treatment.

By placing composite resin over the buccal aspect of the tooth, the emergence profile was improved as well as the width-to-length ratio of the clinical crown (Figure 14). Because of the precise bracket placement, no additional gingival recontouring was needed in the anterior region. The upper right

canine had a cusp tip that remained slightly palatal and needed to be brought more buccally. By placing a thin layer of resin composite over the coronal third of the tooth, the discrepancy was corrected. Finally, it is worth mentioning that, using this approach, an entire smile enhance-

ment was performed without a single diamond or carbide bur (Figures 15–17).

DISCUSSION

With recent advancements in bonding, wear, and polishability, new resin composites offer exceptional opportunities to practicing



Figure 17. Occlusal view of a finished upper arch.

dentists to merge restorative, orthodontic, and periodontal treatments to achieve the most conservative and cost-effective approach to solving many esthetic challenges. This approach also is suited for patients with a limited budget and a great concern for the removal of healthy tooth structure for esthetic purposes.

Although the author realizes that there are a number of patients who would not accept any orthodontic treatment regardless, it is his clinical experience as well as professional conviction that there is a significant part of the patient population willing to consider orthodontic treatment if time is taken to explain its true benefits in preserving tooth structure. The preservation of healthy tooth structure wherever possible, and often with the added benefit of a

substantial monetary savings, appears to be a great incentive in accepting the proposed treatment. An honest, straightforward, and clear presentation of the treatment plan, along with full disclosure of possible shortcomings, is of great importance.

DISCLOSURE

The author does not have any financial interest in any of the manufacturers whose products are mentioned in this article.

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