Cosmetic Concerns Provide Opportunity for Comprehensive Dentistry

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ABSTRACT

This case involved a woman with occlusal dysfunction who was dissatisfied with her smile because of the unsightly display of gold crowns in her posterior and unattractive mottling on her anterior teeth. Factors such as a significant history of clenching and grinding, the management of active disease and infection, and the patient's desire for an ideal or "media-generated" smile increased the difficulty of the case. As part of a comprehensive restorative plan that included disease control treatment, root canal therapy, and orthodontics to idealize tooth positioning, a Kois deprogrammer was used to evaluate the patient's increasingly symptomatic, unacceptable function. In addition to reducing functional and biomechanical risks, the case resulted in improved esthetics with which the patient was highly pleased.

Often times patients seeking cosmetic improvements are unaware of other possible oral problems that may potentially be contributory to their esthetic issues. A thorough analysis of the patient's oral condition can frequently lead to the realization that functional and biomechanical problems are prevalent. By performing a systematic assessment of not only the patient's cosmetic condition but also the patient's dental health risks and any active disease, a clinician can develop a comprehensive restorative treatment plan.

CLINICAL CASE OVERVIEW

A 44-year-old woman presented for evaluation and improvement of her smile. Her chief complaint was the unattractive gold display of her posterior crowns coupled with unsightly "white spots" on her anterior teeth (Figure 1 and Figure 2). Her compelling purpose for seeking treatment was to achieve a "great smile."

The patient's medical history was noncontributory. In discussing her dental history, it was discovered that she had a significant amount of clenching and grinding, with reported nightguard use for more than 10 years. She experienced frequent morning headaches with or without the use of the nightguard. The patient also reported that tooth decay was a common finding at her dental examinations. She had previously been diagnosed and treated for periodontal disease but had inconsistent follow-up care. A comprehensive assessment was initiated to thoroughly evaluate her condition and provide predictable options for her care.

DIAGNOSTIC FINDINGS

Periodontal: The periodontal evaluation revealed probing depths of 2 mm to 3 mm in the anterior sextants and 2 mm to 5 mm in the posterior sextants. Generalized light bleeding on probing was noted in the posterior. Radiographic examination

revealed generalized mild to moderate horizontal bone loss of 1 mm to 3 mm. A vertical osseous defect was discovered on the mesial of tooth No. 15 with an associated probing depth of 5 mm (Figure 3). A periodontal diagnosis of AAP type II (mild periodontitis) was made.
Risk: Low
Prognosis: Good overall with a site-specific fair prognosis for tooth No. 15 due to the mesial vertical bony defect.

Biomechanical: The radiographic examination identified apical pathology on teeth Nos. 2 and 15 (Figure 3 and Figure 4). A diffuse, mixed radiographic lesion (Figure 4) was visible apical to teeth Nos. 3 and 4, having an appearance consistent with a mucous retention cyst.[1] Clinically, teeth Nos. 2 and 15 both tested nonvital, while teeth Nos. 3 and 4 tested vital. Active tooth decay was found on teeth Nos. 15, 19, and 28. Teeth Nos. 2, 3, 12 through 15, 28, and 31 had defective, ill-fitting restorations. Teeth Nos. 2 through 4, 13 through 15, 18 through 20, and 29 through 31 were noted as structurally compromised due to the size, type, and depth of the restorations. Additionally, teeth Nos. 23 through 26 showed early signs of chemical erosion on the incisal edges. Tooth No. 3 presented with a bony exostosis on the buccal (Figure 5), creating short clinical crown height and a subsequent restorative compromise.
Risk: High
Prognosis: Poor with a hopeless prognosis for teeth with untreated tooth decay.

Fig 1.

Fig 2.

Fig 1. The patient was unhappy with her smile. **Fig 2.** The patient's smile before treatment. Note the tooth mottling, gold display, uneven tissue levels, and malposed teeth.

Functional: With most of the patient's posterior teeth having been restored with crowns (Figure 6 and Figure 7) it was important to interpret the patient's history and occlusal findings closely. The gold crowns on teeth Nos. 2 and 5 had holes worn in the occlusal surfaces with evidence of minimal wear on her other posterior crowns and natural dentition. Moderate wear was evident on the gold crown on tooth No. 31. A diagnosis of acceptable function could not be considered due to her long-term history of clenching and grinding, more than 10 years of nightguard use, joint sounds, and morning headaches. At the time of examination, she presented with tenderness to palpation of the right joint lateral pole rated at "5" on a scale of 1 to 10.[2] Right masseter and temporalis muscles were also tender, with a rating of "5." Load and resistance tests were normal. The right joint popped on opening with moderate intensity and had mild crepitus. There was no deviation on opening, and the range of motion was well within normal limits. Primary occlusal traumatism was noted on teeth Nos. 4 and 13. Teeth Nos. 6 through 11 and 22 through 27 were not touching in maximal intercuspation. Teeth Nos. 3 and 30 as well as Nos. 14 and 19 were in cross-bite (Figure 5 and Figure 8). The patient had an Angle's Class I occlusion. A diagnosis of occlusal dysfunction was made given the history and examination findings.
Risk: Moderate
Prognosis: Fair

Dentofacial: Evaluation of the patient's smile revealed medium maxillary lip dynamics and tissue display in a full smile (Figure 2). Uneven maxillary gingival levels, visible buccal bony exostosis on tooth No. 3, rotated and malposed teeth, mottling on multiple front teeth, a "reverse smile line," tooth asymmetry, and an uneven maxillary occlusal plane were all significant findings in the dentofacial evaluation. The patient's desire for an ideal or "media-generated" smile increased the case difficulty. The medium maxillary lip dynamics and subsequent tissue display created the risk evaluation for the case.
Risk: Moderate
Prognosis: Fair

TREATMENT GOALS

The goal of treatment was to comprehensively address the patient's dental health risks, active disease, and cosmetic desires. The first treatment goal was to manage active disease and infection. Following disease control therapy, comprehensive orthodontic therapy was recommended to idealize tooth positions to improve esthetics and function. After completion of orthodontic therapy, the author reassessed the patient's esthetic desires and functional needs to create a comprehensive restorative plan.

TREATMENT PHASES

Phase 1: Active Periodontal Therapy, Endodontic Therapy, Caries Control

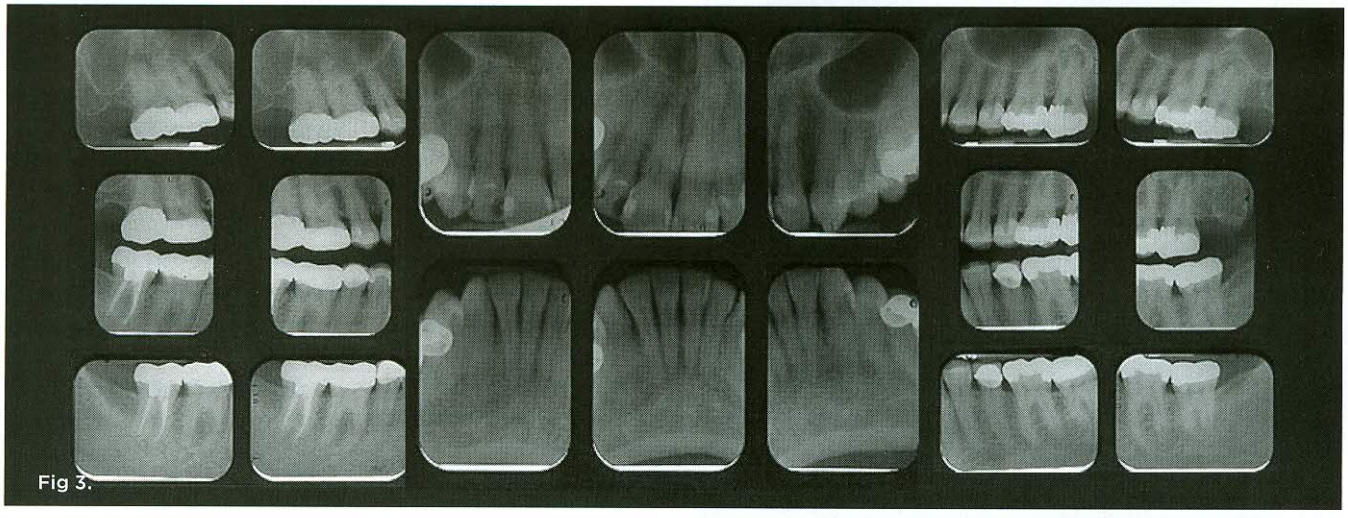
Active periodontal therapy was performed to begin management of the patient's early periodontal disease. Following active therapy, she was appointed for supportive periodontal therapy visits at 6-month intervals.

Root canal therapy was performed on nonvital teeth Nos. 2 and 15 (Figure 9). A composite restoration was placed in the endodontic access on the gold crown on tooth No. 2. Due to the presence of active caries, the gold crown on tooth No. 15 was replaced with a composite CAD/CAM-generated crown, which functioned as a long-term provisional restoration until orthodontic therapy was completed.[3] A mesial-occlusal-distal (MOD) composite and a buccal composite were used to restore the carious lesions on teeth Nos. 28 and 19, respectively. Treatment was deferred on teeth with questionable restorations and structural compromises until completion of orthodontic therapy.

A caries management program was implemented consisting of in-office fluoride varnish applications at the patient's re-care visits and daily at-home alkaline anti-caries rinses (CariFree® treatment and maintenance rinses, Oral BioTech, www.carifree.com).[4] The high pH treatment rinse was used twice daily for 30 days, followed by ongoing use of the maintenance rinse twice daily.

Phase 2: Comprehensive Orthodontics

The patient was referred for a comprehensive orthodontic evaluation. The expectation of treatment was to level the maxillary



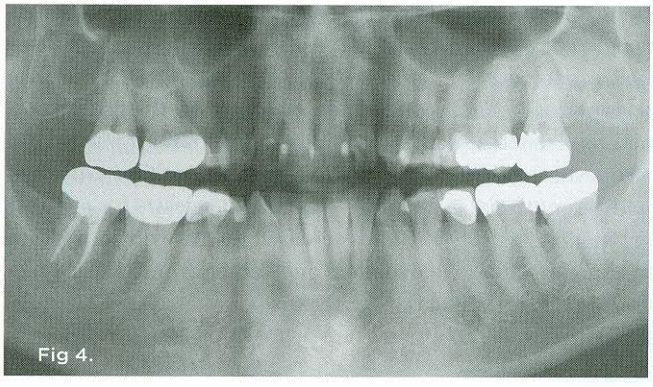


Fig 3. Pretreatment full-mouth radiographs showing the apical pathology on teeth Nos. 2 and 15, mesial bony defect on tooth No. 15, and the condition and size of patient's pre-existing restorations. **Fig 4.** Pretreatment panelipse showing apical pathology on teeth Nos. 2 and 15 and sinus pathology apical to teeth Nos. 3 and 4. **Fig 5.** Right lateral view before treatment. Note the coronal gingival position and bony exostosis of tooth No. 3, and the cross-bite of teeth Nos. 3 and 30. **Fig 6.** Maxillary arch before treatment showing holes worn in the gold crowns of teeth Nos. 2 and 15 as well as pre-existing restorations. **Fig 7.** Mandibular arch before treatment showing moderate wear on tooth No. 31 and early chemical erosion on teeth Nos. 23 through 26. **Fig 8.** Left lateral view before treatment showing cross-bite of teeth Nos. 14 and 19 as well as buccal tooth decay on No. 19. **Fig 9.** Final treatment full-mouth radiographs showing apical healing of the lesions on teeth Nos. 2 and 15 as well as the fit of the final restorations.

occlusal plane, correct the rotations and cross-bites, and align the teeth, while improving tissue levels and function. The primary goal of orthodontics was to establish ideal tooth position for restorative treatment (Figure 10 through Figure 12).

Orthodontics was recommended for this patient to minimize the amount of tooth reduction that would have been necessary had her teeth remained malaligned. From a comprehensive treatment planning position, increased tooth reduction significantly weakens teeth, thereby increasing a patient's biomechanical risk while reducing the long-term prognosis.[5] An acceptable esthetic result is also less predictable when restoring malposed teeth.

Phase 3: Functional Management, Maxillary Restoration, Crown-Lengthening Surgery

The frequency and intensity of the patient's headaches decreased significantly during orthodontic treatment. Several months following the completion of orthodontics, the patient again began complaining of muscle pain, headaches, and clenching and grinding symptoms with increasing frequency. Maxillary and mandibular alginate impressions were taken and casts were created for fabrication of a Kois deprogrammer.[6] Resembling an orthodontic Hawley-type appliance, the Kois deprogrammer (Figure 13) consists of an acrylic lingual plate and a flat cingulum ramp that discludes all posterior teeth. The purpose of this appliance is to deprogram the muscles of mastication and permit the jaw to move to a neutral position in the joint space (a centric relation or adapted centric posture position). The deprogrammer is used to diagnose occlusal disease and evaluate patients' symptoms as they relate to the temporomandibular joint (TMJ), functional concerns, clenching, and grinding. Patients are typically instructed to wear the appliance continuously (except while eating) and return in 2 to 3 weeks to confirm that they are "deprogrammed" (ie, confirm that the muscles of mastication are relaxed and the TMJs are in a consistent and reproducible position). Once confirmed, a bite

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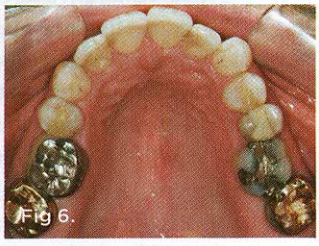
Fig 5.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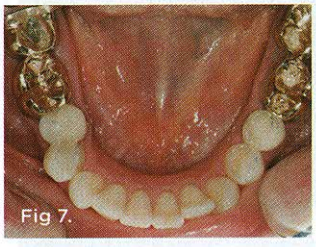
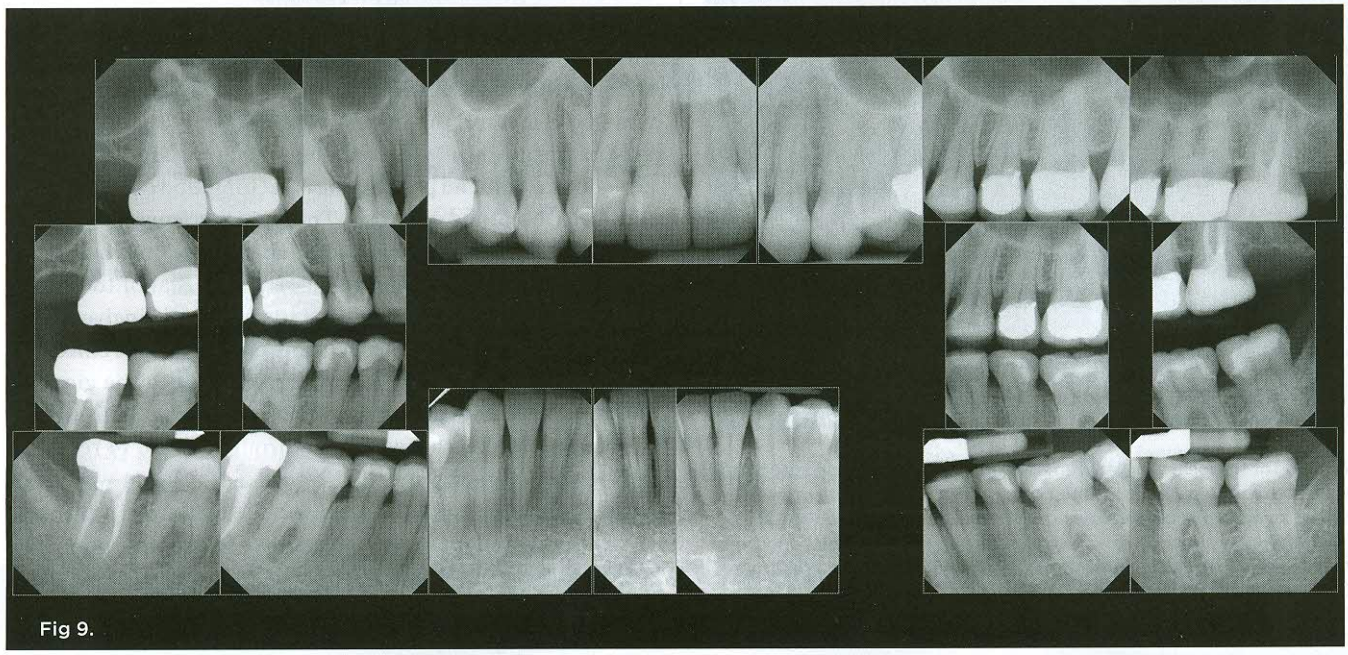


Fig 7.

Fig 8.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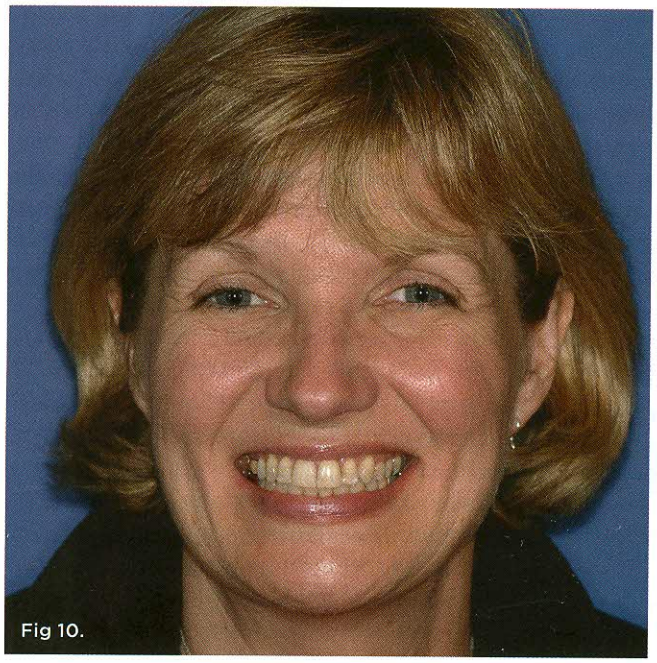
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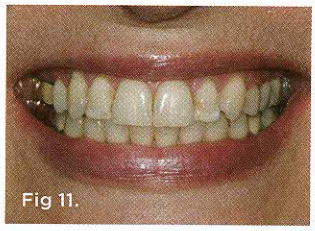
Fig 11.

Fig 12.

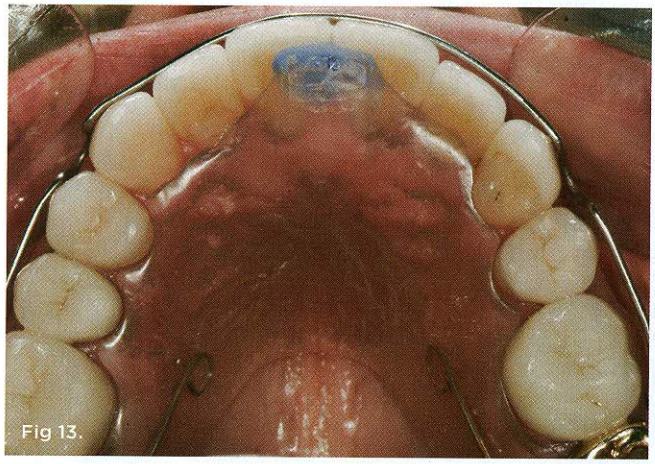
Fig 13.

Fig 10. Tooth position improvements are shown following orthodontic treatment. **Fig 11.** Cross-bite correction and remaining uneven tissue levels are shown following orthodontic treatment. **Fig 12.** Post-orthodontic photograph shows coronal gingival level and bony exostosis on the buccal of tooth No. 3. **Fig 13.** Kois deprogrammer used throughout the patient's care to diagnose and manage the functional requirements of this case. Note the blue reline material on the lingual of teeth Nos. 8 and 9.

record is taken for mounting patient models, functional planning, and treatment option development.

In this case, the Kois deprogrammer was used to evaluate the patient's increasingly symptomatic unacceptable function. Her symptoms abated after wearing the deprogrammer for 2 weeks. An interocclusal recording of the "deprogrammed position" was made and study models were mounted in the adapted centric posture position on a semi-adjustable articulator for evaluation and treatment planning. Utilizing the mounting, premature and deflective contacts on the articulated models were adjusted, establishing an acceptable vertical dimension of occlusion[7] at which the case would be treated. The interproximal extensions on the Kois deprogrammer were relieved, and the deprogrammer was placed on the master cast. The occlusal surface of the flat cingulum ramp was adjusted down to match the vertical dimension of occlusion established for the case. This procedure prepared the deprogrammer to provide a stable, repeatable occlusal guide for use at future clinical appointments.

Following the adjustment to the mounted master models, the models were sent to the laboratory for diagnostic waxing of teeth Nos. 3 through 14 to correct occlusion and improve esthetics in preparation for restorative care. It was requested that the laboratory wax to correct tissue levels on tooth No. 3, which had coronal tissue height and bony exostosis on the buccal, as well as tooth No. 12 where coronally positioned tissue created visual disharmony. The plan was to make the cosmetic corrections to the teeth and tissue and equilibrate the occlusion in concert with the restorative treatment. Using the diagnostic waxing, polyvinyl stents were fabricated for creating provisional restorations and to use as reduction guides during preparation.

The patient was appointed for preparation of teeth Nos. 3 through 14 as well as esthetic gingival correction surgery[8-10] on teeth Nos. 3 and 12. Open-flap crown-lengthening surgery was performed on the buccal of tooth No. 3 by incorporating an internal bevel gingivectomy, elevating a full-thickness periodontal flap, and performing ostectomy and osteoplasty of the buccal bone and exostosis. The flap was then repositioned and sutured into place. A closed-flap esthetic crown-lengthening procedure was performed on the buccal of tooth No. 12. The procedure began with an internal bevel gingivectomy. The ostectomy was performed using a Wedelstaedt chisel intrasulcularly. Sutures were not required. Once the gingival contours were level and symmetrical, teeth Nos. 3 through 14 were prepared. Teeth Nos. 3, 4, 6 through 11, and 14 received composite core build-ups. Teeth Nos. 3, 13, and 14 were prepared for layered zirconia crowns, while teeth Nos. 4 through 12 were prepared for more conservative feldspathic porcelain restorations. Provisional restorations were fabricated using the polyvinyl stents created from the diagnostic wax-ups and a bis-acryl temporary material.