Fixed Rehabilitation of an ACP PDI Class IV Dentate Patient

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This clinical report describes the prosthodontic rehabilitation of a Class IV dentate patient. Maxillary and mandibular fixed restorations were constructed for the therapy. Canine-protected occlusion was developed in the definitive restorations to decrease lateral forces on the posterior dentition. Protrusive guidance was developed to distribute protrusive forces to the maxillary and mandibular incisors.

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INDEX WORDS: full mouth fixed rehabilitation, Class IV dentate patient

F ULL MOUTH FIXED rehabilitation is one of the greatest challenges in prosthodontics. Apprehensions involved in the reconstruction of debilitated dentitions are heightened by widely divergent views concerning the appropriate procedures for successful treatment.¹⁻⁵ In this era, all-ceramic restorations are becoming popular; however, long-term follow-up of patients with complete rehabilitations using all-ceramic restorations are not yet available.⁶ In patients with bruxism, metal-ceramic restorations seem to be a predictable treatment.⁷ They provide adequate strength to withstand the parafunctional activity and improve the longevity of the restorations.

Controversy exists in the definition of bruxism. It has been classified as two types: diurnal and nocturnal. Diurnal bruxism is related to an emotional stress and demonstrates a low rate of bruxism among family members.⁸ Nocturnal bruxism is the non-functional clenching or grinding of teeth during sleep.⁹ It appears to serve no functional purpose and may lead to pathologic conditions including temporomandibular disorders, tooth wear, pain in the periodontium, hypertrophy

Accepted July 6, 2005.

Copyright © 2006 by The American College of Prosthodontists 1059-941X/06 doi: 10.1111/j.1532-849X.2006.00136.x of the masticatory muscles, and headaches.^{10,11} Recently, clinicians have failed to differentiate between nocturnal and diurnal bruxism. It is now certain that these are two different problems occurring in different stages of consciousness, with different etiologies, and requiring different treatments.¹¹

Case reports have documented the destructive effects of foreign objects such as pipe stems, pins, sunflower seeds, and soft drink cans. Wear is found primarily on the occlusal and incisal surfaces of the teeth.¹² Dental erosion in subjects living on an unprocessed food diet have been studied. Compared to the conventional nutrient subjects, subjects living on a raw food diet had significantly more dental erosion lesions.¹³

Excessive occlusal wear may manifest itself in a reduction of the vertical dimension of occlusion. Restored occlusal vertical dimension is based on the concept that, by providing the patient with an interocclusal splint designed to restore the previously lost occlusal vertical dimension, all abnormal muscle activity will be eliminated or reduced.¹⁴ The appliance used to achieve this result is typically designed in the same way as the splint used for occlusal disengagement. This treatment is commonly used for patients with suspected overclosure secondary to the loss of posterior occlusal support.¹⁵

The American College of Prosthodontists (ACP) has developed a Classification System for the completely dentate patient.¹⁶ The Classification System has recently been renamed as the Prosthodontic Diagnostic Index (PDI) and allows patients to be classified based on the severity of

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their pretreatment dental conditions. Class I is characterized by an ideal or minimally compromised tooth condition and occlusal scheme. Class II is characterized by moderately compromised tooth conditions and/or occlusal scheme. Class III is characterized by substantially compromised tooth conditions requiring localized adjunctive therapy in multiple sextants and arches and/or an occlusal scheme requiring reestablishment without a change in the occlusal vertical dimension. In this reported case, the patient was classified as Class IV—severely compromised tooth conditions requiring extensive therapy and/or reestablishment of occlusal scheme with a change in the occlusal vertical dimension.

Clinical Report

Data Collection, Diagnosis, and Treatment Plan

The patient, a 37-year-old Caucasian female, presented with the chief complaint of "I don't like the way my teeth look, my teeth are short, and my back teeth are worn down. My fillings have come out, and I do not like the color." A review of the patient's medical history revealed that she had no contraindications to dental treatment. The patient had orthodontic treatment twice, once for 3 years from 1971 to 1973, and in 1978 for 1 year of treatment. During the past 4 years, her composite resin and amalgam restorations had begun to fail. The patient reported nocturnal grinding of her teeth and occasional clenching during the day. She reported eating unrefined grain food products every day for the last 5 years.

Physical Examination

The extra- and intra-oral findings were unremarkable. Probing depths in both arches were between 2 and 3 mm with minimal bleeding; however, a generalized mild marginal gingivitis was present. No abnormal tooth mobility was noted. Her oral hygiene was acceptable.

In the maxilla (Figs 1 and 2), all teeth were fully erupted and well aligned except tooth #12 which had minor rotation. The facial midline, the maxillary midline, and the mandibular midline were coincident. All teeth responded within normal limits to thermal and electrical pulp testing. The patient was missing teeth #1, 7, 10, and 16. Defective amalgam restorations were present on teeth #2, 3, and 12 to 15. A defective composite



Figure 1. Occlusal view: maxillary arch.

resin restoration was present on tooth #9. There were cervical lesions on teeth #3 to 5, 9, and 12 to 14. In the mandible (Figs 2 and 3), all teeth were fully erupted and well aligned except tooth #25, which was mesially displaced. The patient was missing teeth #17, 21, 28, and 32. Defective amalgam restorations were present on teeth #18 and 19. There were cervical lesions on teeth #19, 20, 22, 23, 28, and 29.

Centric occlusion was not coincident with maximum intercuspation. The patient presented with 2 mm and 3 mm of horizontal and vertical overlap, respectively. Generalized advanced erosion and attrition were noted on the incisal and occlusal surfaces of the teeth in both jaws except for the mandibular incisors. The maxillary incisors, due to the shortness of the teeth, displayed lack of adequate width-to-length proportions. Teeth #5 through 12 had relatively short clinical crowns. Using esthetic and phonetic guidelines, it was determined that maxillary incisal edges would need prosthetic lengthening. Teeth #8, 9, 24, and 25 guided protrusive movement. An Angle's Class



Figure 2. Frontal view: maximum intercuspation.



Figure 3. Occlusal view: mandibular arch.

I relationship was present. Group function was present on both right and left lateral movement.

Radiographic Findings

Trabecular bone pattern was generally normal with a finely woven pattern. Several teeth were restored with amalgam restorations. There were periapical radiolucencies on teeth #23 and 24. Crown-to-root ratios were favorable, all being at least 1:1.5.

Diagnoses

- *1.* Negative medical history
- 2. Chronic mild gingivitis
- 3. Periapical cemental dysplasia #23 and 24
- 4. Defective dental restorations
- Excessive occlusal wear secondary to nocturnal bruxism, clenching, and consuming unrefined grain food with reduced vertical dimension of occlusion.
- 6. ACP PDI Class IV for the dentate patient.

Treatment Plan

- *1.* Preventive procedures to improve oral hygiene, including scaling and oral hygiene instruction.
- 2. Occlusal evaluation, including diagnostic casts, facebow transfer, jaw relation records, articulation of casts, and diagnostic wax patterns.
- 3. Replacement of defective amalgam restorations for teeth #2, 3, 12 to 15, 18, and 19 with hybrid composite resins.
- 4. Construction of a heat-processed acrylic resin occlusal splint to be worn for a period of 3 months to evaluate the patient's tolerance for increase of 3 mm for the anticipated restored vertical dimension of occlusion.

- 5. Preparation of all teeth for metal-ceramic crowns (with porcelain butt margins for teeth #5 to 11 and 22 to 27) with provisional restorations, providing the patient with a mutually protected articulation.
- 6. Reevaluation of the restored vertical dimension of occlusion with the provisional restorations.
- 7. Restoration of all teeth with metal-ceramic crowns, providing the patient with a mutually protected occlusion.
- 8. Construction of a heat-processed acrylic-resin maxillary occlusal splint for use during sleep and during the day as needed.
- 9. Post-insertion and oral hygiene instructions.
- 10. Full mouth radiographic survey and panoramic radiograph to serve as a baseline for future evaluations.
- 11. Placement in periodic recall every 6 months.

Treatment

The treatment plan was presented to the patient. The type of restorations, restorative materials, esthetic expectations, complications, limitations, and oral hygiene requirements were discussed. The patient appeared to understand and signed a consent form. Two sets of diagnostic casts were made using irreversible hydrocolloid (Jeltrate alginate, Dentsply, York, PA) and Type IV high strength dental stone (Prima-Rock, Whip Mix Corp, Louisville, KY). A centric relation record was made. Clutches were constructed and were used for recording the transverse horizontal axis with the temporomandibular joint (TMJ) kinematic facebow. With the TMJ system, a stereographic tracing was used to program the TMJ fully adjustable articulator.^{17,18} The stereographic tracing was used to fabricate the customized fossae analogs on the TMJ articulator. Two sets of diagnostic casts were mounted on the articulator using the TMJ kinematic facebow and a centric relation record. Diagnostic wax patterns, developed to provide a mutually protected occlusion, were made on one set of diagnostic casts with the occlusal vertical dimension opened 3.0 mm at the central incisors. The wax patterns were used to fabricate the tooth preparation guides and provisional restorations.

A maxillary occlusal splint was fabricated at an increased occlusal vertical dimension of 3.0 mm, using heat-processed acrylic resin. The occlusal splint was inserted and adjusted. This splint provided a mutually protected occlusion. One week



Figure 4. Maxillary arch preparation.

later, the patient reported that she had no difficulties in adapting to the new position; she was seen every 2 weeks for 3 months.

The teeth were prepared for metal-ceramic restorations in the maxilla and mandible (Figs 4 and 5). This allowed for provisional restoration of all teeth at an increased vertical dimension with a stable occlusion. Half the increase in vertical dimension was accomplished during preparation and provisional restoration of each arch.⁶ Heat-cured acrylic resin provisional shells were fabricated, relined intra-orally, and cemented with a zinc oxide without eugenol interim cement¹⁹ (Temp-Bond NE, Kerr Corp, West Collins Orange, CA). They were adjusted to ensure that they provided a mutually protected occlusion.

The patient functioned on the provisional restorations for 12 weeks to further assess the adaptation of the proposed vertical dimension for the final restorations.⁶ Centric relation records were obtained by removing the provisional restorations in maxillary and mandibular

anterior segments and placing autopolymerized acrylic resin between the maxillary and mandibular preparations. Once the acrylic resin set in the anterior segment, it was used as an index to maintain the maxillary and mandibular relationship while posterior segment relationships were recorded in an identical manner. A facebow transfer of the maxillary arch was recorded using the same three points of reference as the initial facebow transfer at the diagnostic phase of the treatment. Irreversible hydrocolloid impressions were made of the provisional restorations to fabricate a custom anterior-guide table to aid in the fabrication of the final restorations. After 12 weeks of comfortable function in the provisional restorations, preparations were refined for definitive impressions. At the time of the impression, all soft tissues were healthy.

Maxillary and mandibular full arch impressions were made using vinyl polysiloxane impression material (Express, 3M ESPE, St. Paul, MN). Gingival retraction was obtained using plain braided cord moistened in aluminum-chloride solution. Each impression was poured twice with type IV dental stone (Prima-Rock, Whip Mix Corp). The dies were sectioned and trimmed (Figs 6 and 7). The margins were marked with a red-wax pencil and sealed with thinned cyanoacrylate resin. All dies were painted with two coats of die spacer (Tru-Fit, Geo-Taub Prod & Fusion Co. Inc, Jersey City, NJ), 1 mm short of the margins. The articulator with mounted working casts, diagnostic casts, provisional restoration casts, and a detailed work authorization were sent to the dental laboratory. Metal copings were waxed, invested, and cast in a high noble metal alloy (JRVT High Noble Alloy; Jensen, North Haven, CT).



Figure 5. Mandibular arch preparation.



Figure 6. Maxillary working model.



Figure 7. Mandibular working model.

The metal frameworks were tried intra-orally for adequate position and tightness of proximal contacts, acceptable marginal adaptation, stability, and internal adaptation.²⁰ The castings were returned to the lab for the porcelain (Vita Omega Metal Ceramics, Vita Zahnfabrik, Bad Sackingen, Germany) application. The restorations were returned for bisque bake try-in. Interproximal con-



Figure 10. Occlusal view: mandibular final restoration.

tacts, contour, occlusion, and shade were modified and verified. The completed restorations were examined and tried in. Fit verification, interproximal contacts, and occlusion were accomplished. A mutually protected occlusion was achieved and verified intra-orally using articulating paper (AccuFilm II, Parkell, Farmingdale, NY) and 12- μ m thick shimstock (Almore, Darby Spencer



Figure 8. Frontal view: final restoration.





Figure 9. Occlusal view maxillary final restoration.

Figure 11. Lateral view: left working.



Figure 12. Lateral view: right working.



Figure 13. Postoperative periapical radiograph.

Mead, Westbury, NY). The intaglio surfaces of the restorations were microetched with $50-\mu$ m aluminum oxide, cleaned, and luted with resinmodified glass-ionomer cement (Rely X Luting, 3M ESPE) (Figs 8-12). Periapical radiographs were taken as a baseline for future follow-up and to verify the complete removal of excess cement (Fig 13). A panoramic radiograph was taken as a baseline of condyle and mandibular fossa conditions.^{21,22} Oral hygiene instructions included a review of brushing, flossing, and the use of a fluoride-toothpaste. The patient returned 24 hours post-insertion for the final evaluation. Irreversible hydrocolloid impressions were made.

A heat-processed, clear acrylic resin maxillary occlusal splint providing a mutually protected occlusion was given to the patient to wear during sleep and during the daytime as needed (Fig 14). Instructions on care of and when to wear the occlusal splint were given to the patient. The patient returned at 2 and 4 weeks for an occlusal analysis and for soft tissue evaluation. She was placed on 6 months periodic recall for prophylaxis. The prognosis was favorable. It was explained to the patient that the long-term prognosis of the restorations would depend on the maintenance of oral hygiene and the wearing of the occlusal



Figure 14. Maxillary occlusal device.

splint for protection of the restorations against parafunctional wear.

Discussion

Every patient has unique treatment needs. Proper diagnosis and treatment plan are important but cannot be all-inclusive. Classifying patients using the ACP PDI can be an invaluable aid in predicting future complications. Careful adherence to the guidelines should facilitate successful treatment. The guidelines for treatment of this PDI Class IV patient include the following:

- A comprehensive examination, including a thorough medical and dental history, orofacial and dental clinical examination, dental radiographs, TMD screening history and examination, impressions, and jaw relation records for mounting casts.
- 2. Diagnostic wax patterns and diagnostic occlusal adjustment on duplicated mounted casts.
- 3. Careful planning and consultation regarding the need for preparatory treatment. Careful integration and sequencing of the different areas of treatment needed to enhance the finished result.
- 4. Dentist must consider the advantages and disadvantages of saving teeth according to their eventual role in restoring occlusal function, arch integrity, and esthetics.

References

- Schweitzer JM: An evaluation of 50 years of reconstructive dentistry. Part I: Jaw relations and occlusion. J Prosthet Dent 1981;45:383-388
- Schweitzer JM: An evaluation of 50 years of reconstructive dentistry. Part II: effectiveness. J Prosthet Dent 1981;45:492-498
- Goldman I: The goal of full mouth rehabilitation. J Prosthet Dent 1952;2:246-251
- Bronstein BR: Rationale and technique of biomechanical occlusal rehabilitation. J Prosthet Dent 1954;4:352-367

- Schweitzer JM: A conservative approach to oral rehabilitation. J Prosthet Dent 1961;11:119-123
- Rivera-Morales WC, Mohl ND: Restoration of the vertical dimension of occlusion in the severely worn dentition. Dent Clin North Am 1992;36:651-664
- Raigrodski A: The full mouth fixed rehabilitation of the bruxing patient-achieving function and esthetics. Oral Health 2001;91:40-48
- 8. Glaros AG: Incidence of diurnal and nocturnal bruxism. J Prosthet Dent 1981;45:545-549
- Funch DP, Gale EN: Factors associated with nocturnal bruxism and its treatment. J Behav Med 1980;3:385-397
- Glaros AG, Rao SM: Effects of bruxism: a review of the literature. J Prosthet Dent 1977;38:149-157
- Rugh JD, Harlan J: Nocturnal bruxism and temporomandibular disorders. Adv Neurol 1988;49:329-341
- 12. Ehrlich J, Hochman N, Yaffe A: Contribution of oral habits to dental disorders. Cranio 1992;10:144-147
- Ganss C, Schlechtriemen M, Klimek J: Dental erosions in subjects living on a raw food diet. Caries Research 1999;33:74-80
- Christensen J: Effect of occlusion-raising procedures on the chewing system. Dent Pract Dent Rec 1970;20:233-238

- Clark GT: A critical evaluation of orthopedic interocclusal appliance therapy: design, theory, and overall effectiveness. J Am Dent Assoc 1984;108:359-364
- McGarry TJ, Nimmo A, Skiba JF, et al: Classification system for the completely dentate patient. J Prosthodont 2004;13:73-82
- Swanson KH: Complete dentures using TMJ articulator. J Prosthet Dent 1979;41:497-506
- Hertrampf G: Reconstruction in the TMJ articulator. Quintessence Dent Technol 1976;1:19-27
- Naylor WP, Beatty MW: Materials and techniques in fixed prosthodontics. Dent Clin North Am 1992;36:665-692
- Padilla MT, Bailey JH: Margin configuration, die spacers, fitting of retainers/crowns, and solding. Dent Clin North Am 1992;36:743-764
- Weinberg LA, Chastain JK: New TMJ clinical data and the implication on diagnosis and treatment. J Am Dent Assoc 1990;120:305-311
- 22. Larheim A, Johannessen S, Tveito L: Abnormalities of the temporomandibular joint in adults with rheumatic disease. A comparison of panoramic, transcranial and transpharyngeal radiography with tomography. Dentomaxillofac Radiol 1988;17:109-113

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