Porcelain onlays in restoration of vertical dimension

Presented here is a case in which porcelain onlays and a removable centric relation appliance are used to restore vertical dimension.

Case report
A 36-year-old man sought treatment at a university dental clinic for severe occlusal erosion of all his teeth (Fig. 1a). His medical history revealed a history of drug abuse. During the time of drug abuse, he often regurgitated his food, which probably resulted in severe incisal and occlusal wear to his dentition (Fig. 1b).

A complete occlusal and temporomandibular joint (TMJ) analysis was performed. Radiographic and clinical findings of the TMJs were normal. No TMJ sounds were evident and there was no tenderness or muscle spasm observed during palpation of the masticatory muscles. The maxillary second and third molars and mandibular left first, second, and third molars were missing. Because of the severe occlusal erosion, a significant loss of vertical dimension of occlusion was a likely finding [Fig. 2]. Primary alginate impressions were taken and an anterior deprogrammer was fabricated to allow muscle relaxation prior to making the centric relation record.[2]

Removable centric relation appliance
Diagnostic casts were made and mounted with an arbitrary face-bow transfer and centric relation record.[3] A second appointment was scheduled for 10 days later. At that time, the lost vertical dimension of occlusion[4] was determined by various methods such as phonetics[5] swallowing, and measuring[6] from the base of the anterior nasal spine to the inferior border of the chin in the rest position. A centric relation occlusal appliance was made to cover the mandibular teeth to provide a stable and functional occlusion and to reestablish the vertical dimension of occlusion (Fig. 3).[7] The occlusal thickness of the appliance was 3 mm in the first molar area. Incisal and canine disclusion was provided for excursive movements.

The patient tolerated the increased vertical dimension very well for four months while routine dentistry was performed. No subjective symptoms were noted. The occlusion was checked and adjusted monthly. Tooth No. 10 received endodontic treatment and was prepared for a post-core and crown restoration. Prewaxing was done on study models to determine esthetics and morphology of the maxillary anterior teeth at the previously established vertical dimension.

Restorative therapy
Restorative work began with preparation of teeth No. 6 through 11. Temporary crowns were fabricated and adjusted until the desired shapes and lengths were obtained. They were cemented and duplicated and forwarded to the laboratory. At this stage, the anterior segment of the mandibular centric relation appliance was removed to provide space for the anterior temporary crowns. Porcelain-fused-to-metal crowns were completed and cemented in place for the six maxillary anterior teeth at the established vertical dimension of occlusion.

It was determined that the posterior occlusion would be established by making a three-unit cantilever fixed-partial denture on the left side of the mandible, using teeth No. 20 and 21 as abutments and a cantilever pontic replacing tooth No. 19. The remaining posterior teeth were restored and caries free; therefore, conservative restorations were considered. It was decided that bonded porcelain onlays (Mirage Porcelain System)* would be used to restore the six maxillary and one mandibular posterior teeth.[9,10]

Minimal preparation was required to ensure 360° coverage of sound enamel for proper bonding to the porcelain interface (Fig. 4). All exposed dentin was covered with glass ionomer cement.[10] In areas near the pulpal floor, further protection with calcium hydroxide base was necessary. The final mandibular full-arch impression was taken with polyether material (Impregum) and sent to the laboratory for fabrication of the porcelain onlays.

Try-in and cementation
The porcelain onlays were checked and fitted on the master cast and against the mounted opposing cast. The fit, occlusion, and shade were checked in the mouth (Fig. 5). A rubber occlusion was placed. The teeth were cleaned with flour of pumice and rinsed. The enamel
Fig. 1a. Severe attrition of anterior dentition with loss of vertical dimension.

Fig. 1b. Loss of vertical dimension of posterior teeth.

Fig. 2. Occlusal, preoperative view of the maxillary dentition reveals severe erosion.

Fig. 3. Mandibular centric relation appliance is in place to reestablish proper vertical dimension of occlusion prior to reconstruction.

Fig. 4. Preparation of the maxillary posterior teeth with glass ionomer cement in place prior to taking the final impression. There is adequate sound enamel for proper bonding on porcelain onlays.

Fig. 5. Mirage inlays in place on working articulated cast.
was etched and thoroughly rinsed. A coupling agent was applied to the porcelain onlays and air dried (oil-free) immediately. A bonding agent was applied to the silane surfaces. Clear matrix strips were placed and wedged to avoid interproximal flash. A dual-cure cement (Dual Cement Vivadent) was used to enhance light penetration through the thick onlays (Fig. 6). Dual cement is a highly filled radiopaque bonding resin used to cement laboratory-fabricated porcelain restorations. It contains both light- and chemical-activated catalysts to ensure thorough polymerization.

**Finishing**

Excess resin cement was removed with fine-diamond rotary instruments using a water/air spray. The interproximal contacts were tested with dental tape to ensure there was no excess resin cement. The occlusion was checked and adjusted. Reshaping and smoothing was done with fine-grade diamonds and a water/air spray, followed by polishing with a fine-diamond polishing paste on a soft-rubber cup.

During this appointment, the three-unit cantilever also was cemented permanently (Fig. 7a and 7b). The occlusion was adjusted at subsequent appointments.

**Summary**

We presented a conservative method to preserve remaining tooth structure while restoring lost vertical dimension of occlusion with the use of porcelain onlays. The advantages of a centric relation appliance for tentatively reestablishing the vertical dimension of occlusion were discussed. This reversible appliance can be used to determine an accepted vertical dimension of occlusion in centric relation.

**References**