Onlay partial denture technique for assessment of adequate occlusal vertical dimension: A clinical report

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Clinical treatments that require restoration of occlusal vertical dimension pose a challenge to prosthodontists. This article describes the modification of existing removable partial dentures into onlay interim prostheses. This process allowed the patient's tolerance to the restored occlusal vertical dimension, esthetics, and phonetics to be evaluated before irreversible changes were made to the dentition. (J Prosthet Dent 2002;87:1-4.)

Occlusal vertical dimension (OVD) is defined as the vertical measurement of the face between 2 selected points (superior and inferior to the mouth) when the occluding members are in contact.[1] To evaluate the adequacy of this measurement, it must be compared to the physiologic rest position of the mandible, which is defined as the habitual postural position of the mandible when the patient is relaxed with his/her head in the upright position.[1] The rest position should have a higher value than the OVD; the difference is referred to as the interocclusal rest space.[1] This space is necessary for normal patient function.

Dawson[2] suggests that as teeth are worn, the alveolar bone may undergo an adaptive process and, in some instances, compensate for the loss of tooth structure. Therefore, assessment of the OVD should be made prior to the initiation of restorative treatment for patients with excessively worn dentitions.

It is commonly believed that changes to the OVD should be conservative and that a trial period with an interim prosthesis is desirable.[2] Several techniques have been advocated for this purpose, including the fabrication of transitional removable partial dentures (RPDs) at the desired OVD, use of an acrylic splint, and use of provisional restorations.[3] Because treatments may be costly and time consuming, it is preferable to use a prosthesis that does not permanently change the dentition during the assessment period. This article describes a method of evaluating adaptation to the restoration of OVD by modifying the patient's existing partial dentures into onlay prostheses.

CLINICAL REPORT

A 69-year-old man was self-referred to the College of Dentistry at New York University; his chief complaint was chewing difficulty and poor esthetics. The patient was in good general health and had no medical or dental history that contraindicated his dental treatment. Initial examination revealed wear of the maxillary and mandibular anterior teeth that compromised esthetics. The patient had been wearing maxillary and mandibular RPDs that also showed excessive wear. An extensive evaluation was performed that included an intraoral examination of the teeth, supporting structures, and oral hygiene; extraoral examinations of the temporomandibular joints, as well as facial height and symmetry in OVD and the physiologic rest position; an analysis of occlusion, esthetics, and phonetics; and an examination of the prostheses and radiographs.[3,4] A summary of the significant findings is presented in Table I.

Fig. 1. Preoperative intraoral frontal view.

At the completion of the examination, it was determined that the patient had 3 to 4 mm of interocclusal distance (Fig. 1).[5] The optimal position of the maxillary central incisor edges was determined phonetically with the incisors lightly touching the junction of the wet and dry border of the lower lip during pronunciation of fricative sounds.[6,7] In addition, based on the rule of golden proportions, the length of the central incisor was estimated.[8,9]

To assess the patient's tolerance and acceptance of restored OVD, the existing partial prostheses were modified into onlay prostheses before irreversible permanent restorations were undertaken. Diagnostic casts

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Table I. Significant findings during initial patient assessment

Intraoral examination	Excessive loss of tooth structure as a result of wear
	Healthy peridontium with sufficient bone support
	Lack of posterior occlusion
	Class I jaw relationship with mandibular anterior posturing
Extraoral examination	Slight decrease in facial height
	Inversion of maxillary lip
	Interocclusal rest space of 3 to 4 mm
Smile analysis	No touch of maxillary teeth to lower lip in smile
	Straight maxillary incisal edge alignment in relation to lower lip
	Increased vestibular space
Phonetic evaluation	F-V position: maxillary incisor to lower lip adequate in horizontal plane, inadequate in vertical plane
	S position: acquired "s" sound deficiency due to excessive space caused by inadequate occlusal vertical dimension and lack of anterior tooth length
Initial prostheses assessment	Poor plane of occlusion
	Lack of occlusion as a result of excessive wear of acrylic teeth
	Inadequate border extensions

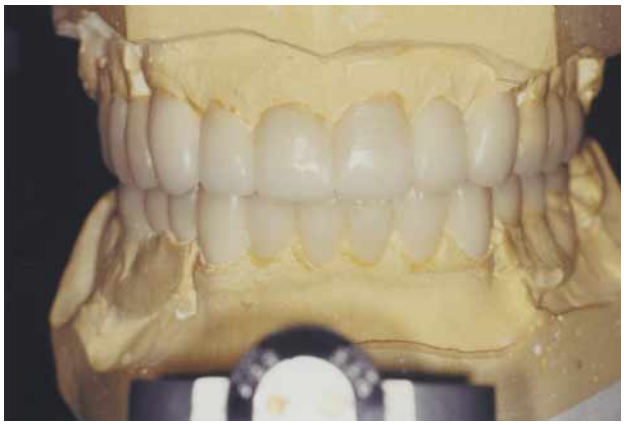

Fig. 2. Mounted diagnostic wax-up.

were made, as were face-bow and protrusive records. Casts were mounted in centric relation in a semi-adjustable articulator, and condylar angles were determined and set with the use of a protrusive record. A diagnostic wax-up was performed on the casts with a 4-mm increase in the OVD in the anterior tooth region. On this wax-up, the proportions of the maxillary anterior teeth were corrected to the estimated 0.618 width-to-height ratio of central incisors, based on the golden proportions (Fig. 2).[8-10] In addition, the diagnostic wax-up corrected the mandibular central incisor edges to the lingual position of maxillary anterior teeth (class I relationship) in order to achieve a stable position.[2]

The casts were duplicated in stone (Microstone; Whip Mix Corp, Louisville, Ky.), and vacuum-formed shells were fabricated. To incrementally restore the OVD, interim onlay prostheses were fabricated for 1 arch at a time, starting with the mandible. In the presence of the patient, the mandibular onlay partial denture was fabricated. The mandibular acrylic teeth on the patient's existing RPD were abraded with an acrylic cutting bur (H257; Brasseler USA, Savannah, Ga.), and retentive grooves were created. The freshly cut areas of the denture were coated with polymethyl methacrylate monomer (Lucitone Liquid; Dentsply International Inc, York, Pa.). The prosthesis was then inserted into the patient's mouth. A plastic syringe was used to place a condensed mixture of autopolymerizing tooth-colored acrylic resin (Jet; Lang Dental Manufacturing Co, Wheeling, Ill.) in the mandibular vacuum shell such that 50% of the height of the teeth was covered.[11] After the acrylic reached the doughy stage, the vacuum shell was placed intraorally, and the patient was guided and maintained in the predetermined centric relation during the initial set. The shell and the prosthesis then were removed, and excess bulk of the acrylic was trimmed and polished.

The interim prosthesis was delivered to the patient, who was assessed for 3 months. During this period, the patient was regularly evaluated for excessive signs of wear on the prosthesis, symptoms of temporomandibular dysfunction, and muscle tenderness. No changes or repairs to the prosthesis were necessary. The interocclusal space was determined to be 3 mm at the end of the assessment period. This evaluation was necessary to confirm the presence of the required space prior to fabrication of the definitive maxillary onlay prosthesis.

Onlay fabrication steps were repeated with the existing maxillary RPD (Fig. 3). An extra appointment was necessary to achieve optimal anterior guidance with both prostheses (Fig. 4).[12,13] The patient's tolerance to new changes made with the maxillary onlay interim prosthesis was evaluated for an additional 2 months, during which time the appliance was well tolerated and maintained by the patient with no

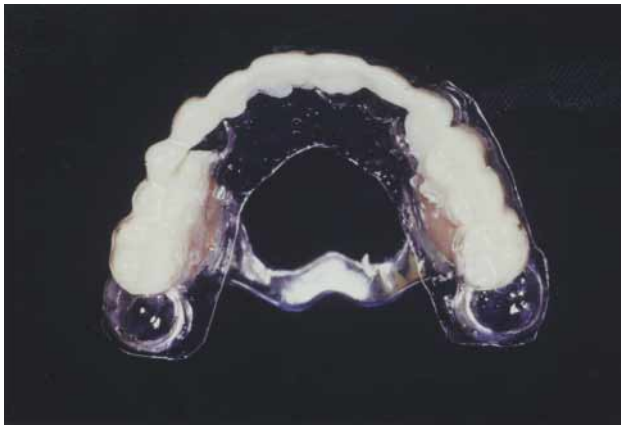

Fig. 3. Utilization of vacuum shell in fabrication of maxillary onlay prosthesis.

Fig. 4. Completed maxillary and mandibular interim onlay prostheses.

adverse effect on phonetics. The fabrication of the definitive prostheses at the newly established OVD was indicated and initiated.

Maxillary and mandibular intraoral impressions of the overlay prostheses were made, and with a centric relation record at the newly established OVD, a face-bow transfer record was made. The final casts were mounted in a semi-adjustable articulator with correct condylar guidance angles. A custom anterior incisal guidance table was established, and the guidance was transferred to the onlay prostheses. New vacuum shells were made from casts of the interim onlay prostheses. In the presence of the patient, the anterior portion of the maxillary onlay prosthesis was sectioned, anterior teeth were prepared, and chairside fixed provisional restorations were fabricated with use of the new vacuum matrix. During subsequent appointments, the process was repeated for maxillary right and left second molars, 6 mandibular anterior teeth, and the mandibular left second molar (Fig. 5). At each of these appointments, the posterior teeth of the prostheses maintained the established OVD.

The patient was maintained in the provisional restorations for 2 months to ascertain his comfort and adaptation to the new OVD. After preparations were completed, final impressions were made, and fixed portions of the prostheses frameworks were fabricated with the guidance from the custom incisal guide table. Framework fit was assessed and verified intraorally. Maxillary and mandibular second molars were restored in gold; these teeth aided in registration and maintenance of the new OVD. After ceramic was applied to the fixed prostheses, they were examined intraorally. Pick-up border-molded impressions of the maxillary and mandibular arches were made and mounted in centric relation. These casts were used to fabricate the maxillary and mandibular RPDs with semi-precision interlock attachments. Fit of the RPD frameworks was

Fig. 5. Anterior maxillary and mandibular fixed provisional restorations and modified interim prostheses.

verified, and the denture teeth were arranged and evaluated intraorally.

The RPDs were processed with a duplicate cast to prevent damage to the fixed prostheses during processing of the teeth and acrylic bases. Ceramo-metal prostheses and RPDs were delivered and evaluated for a period of 2 weeks prior to final cementation.

SUMMARY

The conversion of existing prostheses into onlay dentures has been presented. With this method of assessing a patient's tolerance to restoration of the occlusal vertical dimension, esthetics and function can be established and acceptability can be evaluated before permanent changes are made to the natural dentition.

REFERENCES

1. The glossary of prosthodontic terms. J Prosthet Dent 1999;81:39-110.
2. Dawson P. Evaluation, diagnosis, and treatment of occlusal problems. 2nd ed. St. Louis: CV Mosby; 1989. p. 56-71, 500-10.

3. Fayz F, Eslami A. Determination of occlusal vertical dimension: a literature review. J Prosthet Dent 1988;59:321-3.
4. Turner KA, Missirlian DM. Restoration of the extremely worn dentition. J Prosthet Dent 1984;52:467-74.
5. Pound E. Let /S/ be your guide. J Prosthet Dent 1977;38:482-9.
6. Fayz F, Eslami A, Graser GN. Use of anterior teeth measurements in determining occlusal vertical dimension. J Prosthet Dent 1987;58:317-22.
7. Heinlein WD. Anterior teeth: esthetics and function. J Prosthet Dent 1980;44:389-93.
8. Levin EI. Dental esthetics and the golden proportion. J Prosthet Dent 1978;40:244-52.
9. Ricketts RM. The golden divider. J Clin Orthod 1981;15:752-9.
10. Tjan AH, Miller GD, The JG. Some esthetic factors in a smile. J Prosthet Dent 1984;51:24-8.
11. Hayakawa I, Hirano S. A method to remold worn acrylic resin posterior denture teeth and restore lost vertical dimension of occlusion. J Prosthet Dent 1993;69:234-6.
12. Kohno S, Nakano M. The measurement and development of anterior guidance. J Prosthet Dent 1987;57:620-5.
13. Hellsing G. Functional adaptation to changes in vertical dimension. J Prosthet Dent 1984;52:867-70.

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