Case report: oral rehabilitation of severely worn dentition

By Dov M. Almog, DMD, Michel Ferrara, DDS & Youngman Chun, DDS

Tooth wear occurs as a natural physiologic process. The average wear rates on occlusal contact areas are estimated to be 29 µm per year for molars and about 15 µm per year for premolars (1 micrometer = one thousandth of a millimeter). 

Pathologic wear occurs when the normal rate of wear is accelerated by endogenous or exogenous factors. Tooth wear caused by parafunction is estimated to progress three times faster than physiologic wear.

Tooth surface loss has been classified into the following types:

1) Erosion: loss of tooth surface by chemical processes not involving bacterial action.

2) Attrition: denoting tooth-to-tooth contact during mastication or parafunction.

3) Abrasion: loss of tooth surface caused by abrasion with foreign substances other than tooth-to-tooth contact.

Another classification divides tooth wear into two categories: mechanical wear caused by attrition or abrasion, and chemical wear caused by erosion.

A differential diagnosis is not always possible because often there may be a combination of these processes occurring.

Etiologic factors include bruxism, harmful oral habits, diet, gastroesophageal reflux disease, occupation, eating disorders, xerostomia and congenital anomalies such as amelogenesis imperfecta and dentinogenesis imperfecta.

Clinical parameters have been suggested to aid in diagnosing the type of tooth wear and determining its cause.

Loss of the vertical dimension of occlusion (VDO) caused by physiologic tooth wear is usually compensated for by continuous tooth eruption and alveolar bone growth. In situations where tooth wear exceeds compensatory mechanisms, loss of VDO occurs.

The determination of the VDO can be achieved with several methods, such as phonetics, interocclusal distance and swallowing.

In situations where loss of tooth structure has occurred and VDO is still acceptable, treatment may include crown lengthening, orthodontic movement with limited intrusion, surgical repositioning of a segment of teeth and supporting alveolar bone, and placement of crowns and fixed partial dentures.

In situations where loss of the VDO has occurred, the cast overlay removable partial denture (CORPD) may be a treatment option.

This treatment option has been suggested to be efficient and cost effective, with the final outcome pleasing to the patient. Potential disadvantages of the CORPD prosthesis include compromised esthetics when the dentures are removed; development of caries or periodontal disease as a result of poor oral hygiene; porcelain or resin veneer fracture or discoloration; and possible dissatisfaction with a removable prosthesis.

This clinical report describes the use of maxillary and mandibular CORPD consisting of anterior porcelain veneers and posterior cast overlays in the treatment of a patient with severe tooth wear due to attrition and erosion, including follow-up over three years.

Case report

A 63-year-old African-American male veteran, the subject of this case report, presented us with a noteworthy case of worn dentition. The veteran was referred to our dental service for prosthodontic treatment consideration. The medical and dental histories were recorded, and a full-mouth-series (FMS) of radiographs and Panorex (Fig. 1) were taken.

The relevant medical history included hypertension, tobacco

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Mean</th>
<th>Before Treatment</th>
<th>After Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td>SNA</td>
<td>82°</td>
<td>90°</td>
<td>90°</td>
</tr>
<tr>
<td>SNB</td>
<td>80°</td>
<td>91°</td>
<td>90°</td>
</tr>
<tr>
<td>ANB</td>
<td>2°</td>
<td>-3° (indl. 4.5°)</td>
<td>0° (indl. 4.5°)</td>
</tr>
<tr>
<td>WITS-value</td>
<td>±1 mm</td>
<td>-8 mm</td>
<td>-3 mm</td>
</tr>
<tr>
<td>ML-SNL</td>
<td>52°</td>
<td>20°</td>
<td>20°</td>
</tr>
<tr>
<td>NL-SNL</td>
<td>9°</td>
<td>4°</td>
<td>4°</td>
</tr>
<tr>
<td>ML-NL</td>
<td>27°</td>
<td>16°</td>
<td>16°</td>
</tr>
<tr>
<td>Gonion&lt;</td>
<td>130°</td>
<td>120°</td>
<td>120°</td>
</tr>
<tr>
<td>SN-Pg</td>
<td>81°</td>
<td>95°</td>
<td>90.5°</td>
</tr>
<tr>
<td>PFH/AFH</td>
<td>63%</td>
<td>74%</td>
<td>76%</td>
</tr>
<tr>
<td>N-Sna /N-Me</td>
<td>45%</td>
<td>44%</td>
<td>44%</td>
</tr>
<tr>
<td>Sna-Me/N-Me</td>
<td>55%</td>
<td>56%</td>
<td>56%</td>
</tr>
</tbody>
</table>

Table II: Proportions of skeletal structures before and after treatment.
use and post traumatic stress disorder (PTSD). The clinical examination revealed severe tooth wear extending to the cervical level of the teeth in some areas, attributed primarily to amelogenesis imperfecta.

Clinical determination of the VDO was achieved with the following methods: phonetics, interocclusal distance, swallowing, lip competence and facial appearance. Following careful assessment, it was determined that a 7-millimeter loss of VDO was caused by a combination of attrition, it was determined that a 7-millimeter loss of VDO was caused by a combination of attrition, and the patient elected to have CORPDs using cast frameworks, acrylic teeth and a couple of posterior teeth with metal occlusal surfaces in order to maintain the prospective VDO. The patient was also started on 0.4 percent stannous fluoride once a day (Accelean, Home Care Gel, Henry Schein, Melville, N.Y.) in order to prevent further decalcification of his teeth.

Shortly after, maxillary and mandibular transitional overdentures were fabricated. The new diagnostic VDO and the plane of occlusion were established based on anatomic landmarks and averaged values. These overdentures fit tightly over the teeth and soft tissues, enabling evaluation and adjustment for phonetics, esthetics and occlusion.

The transitional VDO devices were worn for approximately eight weeks, during which time occlusal adjustments were made weekly, and occlusion was modified based on phonetic and estheticic principles as well as patient comfort and ease of function.

In the meantime, the diagnostic casts were surveyed for the most suitable path of insertion of the definitive prostheses. Each cast was placed in a horizontal position and slowly lowered posteriorly on the surveyor until undercuts at the disto-buccal of the bicuspid and molar regions were of sufficient depth (0.25 mm). A slight undercut in the anterior region allowed for use of a rotational path of insertion.

The information from the diagnostic casts was now replicated intraorally. Unsupported enamel was recontoured and polished. Guide planes were placed on any remaining proximal tooth surfaces. Because of the severe wear of many of the teeth, a natural undercut for adequate retention could not be located. Therefore, existing enamel surfaces were slightly modified to create 0.25 mm undercuts.

Dentin exposure was managed with a thorough maintenance program. Rest seat preparations were not needed because the entire occlusal surface of all the teeth served as rests under the cast framework.

Definitive casts were obtained using a polyether impression material (Permadine-Penta II and Permadyne Grant 2:1, 3M ESPE, St. Paul, Minn.) and custom trays (Triad VLC Materials, DENTSPLY International, York, Pa.), and mounted in centric relation. The incisal guiding pin was then adjusted for a 7 mm increase in VDO.

Once the path of insertion was established for both casts, the undesirable undercuts were blocked out with wax, and the casts were duplicated and poured in a refractory investment (Hi-Temp, Whip Mix Corp., Louisville, Ky.). The refractory casts were also mounted in the articulator using a cross-cast mounting procedure between the definitive cast and the refractory casts.

The frameworks were waxed using a thin layer of wax (Flexseal Patterns, DENTSPLY Trubyte/Austenal, York, Pa.) over the teeth, to be included in the prosthesis. A couple of the posterior occlusal surfaces were waxed to occlusion. The wax patterns were cast in a chrome-cobalt alloy (Vitallium, DENTSPLY Austenal, York, Pa.). The cast frameworks were then finished.

The frameworks were evaluated intraorally for fit, occlusion, retention and stability. A

Clinical Determination of the VDO was achieved with the following methods: phonetics, interocclusal distance, swallowing, lip competence and facial appearance. Following careful assessment, it was determined that a 7-millimeter loss of VDO was caused by a combination of attrition, and the patient elected to have CORPDs using cast frameworks, acrylic teeth and a couple of posterior teeth with metal occlusal surfaces in order to maintain the prospective VDO. The patient was also started on 0.4 percent stannous fluoride once a day (Accelean, Home Care Gel, Henry Schein, Melville, N.Y.) in order to prevent further decalcification of his teeth.

Shortly after, maxillary and mandibular transitional overdentures were fabricated. The new diagnostic VDO and the plane of occlusion were established based on anatomic landmarks and averaged values. These overdentures fit tightly over the teeth and soft tissues, enabling evaluation and adjustment for phonetics, esthetics and occlusion.

The transitional VDO devices were worn for approximately eight weeks, during which time occlusal adjustments were made weekly, and occlusion was modified based on phonetic and estheticic principles as well as patient comfort and ease of function.

In the meantime, the diagnostic casts were surveyed for the most suitable path of insertion of the definitive prostheses. Each cast was placed in a horizontal position and slowly lowered posteriorly on the surveyor until undercuts at the disto-buccal of the bicuspid and molar regions were of sufficient depth (0.25 mm). A slight undercut in the anterior region allowed for use of a rotational path of insertion.

The information from the diagnostic casts was now replicated intraorally. Unsupported enamel was recontoured and polished. Guide planes were placed on any remaining proximal tooth surfaces. Because of the severe wear of many of the teeth, a natural undercut for adequate retention could not be located. Therefore, existing enamel surfaces were slightly modified to create 0.25 mm undercuts.

Dentin exposure was managed with a thorough maintenance program. Rest seat preparations were not needed because the entire occlusal surface of all the teeth served as rests under the cast framework.

Definitive casts were obtained using a polyether impression material (Permadine-Penta II and Permadyne Grant 2:1, 3M ESPE, St. Paul, Minn.) and custom trays (Triad VLC Materials, DENTSPLY International, York, Pa.), and mounted in centric relation. The incisal guiding pin was then adjusted for a 7 mm increase in VDO.

Once the path of insertion was established for both casts, the undesirable undercuts were blocked out with wax, and the casts were duplicated and poured in a refractory investment (Hi-Temp, Whip Mix Corp., Louisville, Ky.). The refractory casts were also mounted in the articulator using a cross-cast mounting procedure between the definitive cast and the refractory casts.

The frameworks were waxed using a thin layer of wax (Flexseal Patterns, DENTSPLY Trubyte/Austenal, York, Pa.) over the teeth, to be included in the prosthesis. A couple of the posterior occlusal surfaces were waxed to occlusion. The wax patterns were cast in a chrome-cobalt alloy (Vitallium, DENTSPLY Austenal, York, Pa.). The cast frameworks were then finished.

The frameworks were evaluated intraorally for fit, occlusion, retention and stability. A
new maxillo-mandibular record was made with the frameworks in position, and the definitive casts were mounted on the articulator.

The frameworks were returned to the laboratory for acrylic teeth in the esthetic zone. Although the esthetic zone in the CORPD can be fabricated either with composites or porcelain veneers, in this patient, acrylic teeth were used (Ivoclar Vivadent, Schaan, Liechtenstein) (Fig. 4).

At the patient’s next visit, the CORPDs were inserted (Figs. 5a, b). Following postoperative directions on how to properly insert the prostheses, the patient was provided with instructions on adequate oral hygiene and caries and erosion prevention. These included the application of 0.4 percent stannous fluoride once a day. The veteran was also instructed to take the CORPDs out at night. After two post-insertion visits that included minor adjustments, the patient was placed on a six-month recall.

One year and four months after insertion, the patient presented to the dental emergency clinic with discomfort associated with tooth #8. According to the patient, he had stumbled and clenched his teeth together, resulting in a root fracture of tooth #8, following which he was referred to the oral surgery department for a surgical extraction. After removal of tooth #8, a minor acrylic reline was done in the respective underline region in the maxillary CORPD.

Conclusions
This clinical case report demonstrates that the use of CORPD can be a viable, non-invasive and relatively inexpensive choice of treatment for a patient with severely worn dentition who expresses concerns about treatment invasiveness, long-term durability and cumulative costs for the long-term oral rehabilitation and maintenance.

Editorial note: A complete list of references is available from the publisher.