Managing Severe Periodontal Esthetic Challenges: The Restorative-Surgical Connection

When treating patients with severe periodontal disease, dentists often face the difficult dilemma of how to effectively treat the disease while satisfying patient esthetic demands. Care must be taken to evaluate the patient’s periodontal anatomy and the position of the planned prosthetic margin to ensure proper development of the biologic architecture. The treatment goals for this patient included exposure of adequate tooth structure for the placement of a restorative margin, establishment of a healthy dentogingival complex, and the subsequent fabrication of a well-fitting, esthetically pleasing definitive restoration. This article presents a case where careful communication between the restorative dentist, the periodontal surgeon, and the laboratory technician resulted in a predictable esthetic and restorative outcome while improving the periodontal health of the patient. Key to this collaboration was the use of a structured treatment-planning protocol and the fabrication of a realistic cast, which represented the three-dimensional anterior soft tissue architecture as it was present in the patient’s mouth. Int J Periodontics Restorative Dent 2016;36:83–93. doi: 10.11607/prd.2618

When treating patients with severe periodontal disease, dentists often face the difficult dilemma of effectively treating the disease while satisfying patients’ esthetic demands. Correct clinical crown length is determined by the amount of tooth display necessary for esthetics, and must follow proportion guidelines for pleasing tooth shapes. Surgical crown lengthening may be necessary to expose adequate sound tooth structure when extensive caries, crown fracture, faulty preexisting margins, or failed restorations require the placement of a restoration margin where biologic width violation would be a risk. Periodontal surgery may also be necessary to correct excessive gingival display or to reposition the dentogingival complex as an adjunct to esthetic restorative procedures, or as needed for periodontal health reasons. The proper occlusogingival position of the interproximal papilla is critical to achieve esthetic success and prevent black holes in the interproximal gingival region. In this case, repositioning the periodontal tissues was necessary to correct the compromised dentogingival complex and reestablish more esthetically pleasing proportions of the dentition in the face.

Although numerous techniques and technologies are available to increase the quality and predictability

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of dental treatment, this case was managed with the use of a structured treatment planning approach and a stone cast that accurately represented the preoperative soft tissue contours, to determine clinical end points before any treatment.

The clinical team, composed of a restorative dentist, a periodontal surgeon, and a laboratory technician, created four diagnostic parameters for prosthetically guided surgery in a patient with extensive periodontal disease to decrease periodontal pocket depths and reduce excess tissue display in a nonesthetic gummy smile.

**Case Presentation**

A 58-year-old woman presented with a noncontributory (ASA 1) medical history and generalized advanced periodontal disease (AAP Type IV). Probing depths ranging from 3 to 7 mm were present on teeth 13 to 23 with no mobility (Table 1); the patient exhibited no additional shared risk factors (Fig 1). The loss of supporting periodontal architecture also resulted in compromised esthetics. Unfortunately, the high lip dynamics contributed to a gingival tissue display (gummy smile) that was no longer esthetically pleasing (Fig 2). Most obvious were the asymmetric gingival levels with a generalized facial recession of 2 mm and the interproximal loss of the dental papilla (black holes) (Fig 3).

**Table 1** Periodontal probing scores for teeth 13 to 23

<table>
<thead>
<tr>
<th>Tooth</th>
<th>13</th>
<th>12</th>
<th>11</th>
<th>21</th>
<th>22</th>
<th>23</th>
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<tbody>
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<td>4</td>
<td>3</td>
<td>5</td>
<td>6</td>
<td>6</td>
<td>7</td>
</tr>
<tr>
<td>Facial</td>
<td>3</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>6</td>
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**Fig 1** Initial full-mouth radiograph.

**Fig 2** Patient showing a gummy smile and unesthetic loss of interdental papilla (black holes).

**Fig 3** Intraoral view showing the loss of interdental papilla, gingival asymmetry, and root exposure.
Clinical examination and planning strategy

Diagnostic approach

As the etiology of the open gingival embrasures included bone loss and tooth morphology, the treatment required an interdisciplinary diagnostic approach including periodontal, restorative, and orthodontic evaluations. A careful radiographic examination provided important information to the clinical team and included the use of radiopaque markers to quantify interdental soft tissue loss. The resulting information was used to fabricate a realistic cast that accurately represented the preoperative hard and soft tissue positions. This cast contained the morphologic information for periodontal-restorative simulation. The aim of this approach was to provide a three-dimensional previsualization of the final esthetic outcome that would result from the surgical and restorative laboratory procedures.

Diagnostic findings

The cephalometric analysis indicated that this patient had a skeletal Class II relationship combined with significant anterior vertical overlap. It was also determined that the deep bite was caused primarily by the maxillary tooth position and the relationship of the maxillary incisal edge to the lips. The vertical dimension of occlusion was within the normal range (Fig 4).

Periapical radiographs indicated that the root inclination and position were in the normal range. Radiopaque markers, made by mixing eugenol cement and amalgam powder, were applied between teeth in the black holes to radiographically show the tip of the papilla, the amount of interdental papilla loss relative to the osseous crest, and the interdental contact point position.

Fig 4a (left) Cephalometric analysis was focused on the upper maxilla and the anterior teeth position relative to the lip line. The lower occlusal plane was in the norm, and the upper incisal edge was below the lower lip line.

Fig 4b (below) Clinical view showing the amount of the deep bite (lower blue line). The upper blue line reflects the position of the lower lip line at rest position. These two parameters were measured and confirmed in the cephalometric analysis.
(Fig 5). This approach was useful in determining the new central incisal edge position, interdental contact areas, and teeth sizes in relation to the bone crest and lip lines.\textsuperscript{11}

**Treatment planning and therapeutic sequence**

After full mouth scaling and root planing, all second molars were removed since they presented severe loss of attachment, Class III mobility, and furcation involvement. In accordance with the patient, the decision was made to surgically correct the furcation area of the mandibular left first molar to make it accessible for the hygiene procedures. After this preliminary phase, surgical pocket elimination of the maxillary anterior area was carried out. Four months after the extractions, implants were placed in the maxillary left and mandibular right posterior regions.

Three months later, provisionalals were screwed to the fixtures to serve as anchorage for the orthodontic treatment of the maxillary first premolar, which needed to be moved mesially to better manage the area between the canine and first premolar.

From a restorative point of view, the case was split into two phases: first, the implant impressions were taken, and then, when the esthetic and functional try-in of the posterior areas was ready, the anterior teeth were prepared to receive veneers. At this point, a final impression of the maxillary anterior teeth was made, picking up the posterior bisque bake to finalize the case.

**Fabrication of the realistic cast for anterior evaluation**

The realistic cast included the diagnostic information necessary to redesign the new restorations after the periodontal surgical procedure. The diameters of the roots were replicated directly from the mesiodistal radiograph measurements, to allow a more appropriate form and profiles of the new restorations after the surgical exposure of the roots to avoid an unsatisfactory final esthetic result. In other words, the bone position, gingival amount,
and radicular anatomy were reproduced in an artificial manner by means of probing and radiographic examinations with radiopaque markers (Figs 6 and 7).

Comprehensive presurgical planning

Reducing the periodontal pocket depth represented an opportunity to reestablish a new, healthy dentogingival complex in relation to a more appropriate anterior display.

Based on the diagnostic findings and clinical considerations, the treatment proposed was to move the entire dentogingival complex in an apical direction to compensate for the elongated black holes that would be present after pocket elimination surgery. This would also correct the gummy smile and eliminate the periodontal pockets, while shortening the incisal edge position would reduce the deep bite.

With this periodontal-restorative approach, the initial step was to redefine the upper incisal edge position of the new restorations relative to the lips at rest and the upper smile line.

Four distinct diagnostic parameters were assessed to determine the altered position of the entire dentogingival complex:

1. The location of the ideal incisal edge position in the face
2. Requirements for visual harmony with the posterior maxillary occlusal plane
3. The amount of tooth display due to lip dynamics
4. The position, symmetry, and scallop of the gingival architecture

These four parameters were represented on the realistic cast together with radiographic measurements to previsualize the final result in combination with the correction of the gingival pockets.

After the surgical pocket elimination, the embrasures were in fact compensated for by the shortened overbite of the new restorations. The realistic cast was a useful adjunct to visualize the root position and anatomy relative to new gingival architecture in order to complete the diagnostic wax-up in combination with the surgical pocket elimination (Fig 8).

Restorative planning

Kois stated, “The most critical relationship for biologic health when the clinician is placing a restoration at or below the free gingival margin is the margin location relative to the
The distance from the free gingival margin to the osseous crest on the facial aspect is normally 3 mm based on the most coronal position of the bone, line angle to line angle. The height of the interdental papillae can also be predicted to be 4 mm incisal to the osseous crest between anterior teeth with normal root proximity, assuming the interproximal distance is ≤ 2 mm at the osseous crest. Keeping these parameters in mind, the decision about where to place the restorative margin must be made. Ideally, the margin should be placed at the free gingival crest or slightly supragingival. If an intracrevicular margin is required for esthetic reasons, it should be placed approximately 0.5 to 1 mm apical to the free gingival margin to avoid detrimental effects to the attachment apparatus.

Prior to beginning any restorative treatment, the clinician must take into account these biologic parameters when deciding on both design and material selection for the final restoration. To minimize the tooth preparation and not increase biomechanical risks for structural compromise and pulpal health, veneers were planned to preserve the dental structure with minimally invasive treatment.

Clinical procedures: Surgical periodontal

A submarginal incision was carried out according to the pocket depth previously measured and trans-

Fig 8a This realistic cast exactly mimicked the three-dimensional gingival architecture and crown-root anatomy. The image shows a replica of the soft and hard tissues.

Fig 8b The dotted line marked the incision for the new gingival symmetry relative to the clinical probings and new smile line for surgical simulation.

Fig 8c Surgical simulation of the gingival pocket elimination and root anatomy exposure on the realistic cast. The remaining gingival thickness is 3 mm buccal-palatal and 5 mm interproximal from the bone (stone). This approach allows the clinicians to visualize the esthetic result of the surgery to better plan the restorations.

Fig 8d Planning of new restorations as a consequence of the surgical intervention. Based on the clinical and radiographic analysis, the dental display was moved apically to compensate for the surgical pocket elimination. This is a useful tool to discuss the therapy plan with the patients before any treatment. Veneers were planned to preserve the dental structure with minimally invasive treatment.
ferred to the buccal gingiva, and a full thickness flap was elevated to expose the alveolar bone (Figs 9a and 9b). Once the secondary flap was removed, the maxillary left central incisor was lengthened, giving particular care to remodel the peak of bone on the mesial aspect of that tooth (Fig 9c). The mock-up made on the realistic cast was used in this phase to check the new prosthetic margin location relative to

Fig 9a A submarginal incision was made according to the pocket depth.

Fig 9b The flap was raised to expose the bone structure.

Fig 9c An osteoplasty was performed to level and align the scallops according to the new smile line. The maxillary first premolar was also included in the treatment for esthetic reasons.

Fig 9d The mock-up was used to check the new prosthetic margin location relative to the bone and the new incisal edge position.

Fig 9e Connective tissue suture.

Fig 9f Clinical view 2 months postoperative.

Fig 9g Clinical view 18 months postoperative. This extended postoperative follow-up was strategically planned with the patient because of postsurgical healing and orthodontic therapy on the posteriors. The anterior surgical pocket elimination was planned as the first step after professional hygiene and extraction of the molars.
the bone and the new incisal edge position (Fig 9d). The roots were scaled and the flap was then placed at the predetermined gingival margin level based on the information derived from the working cast, with respect to the biologic width and the esthetic upper lip smile line. The full thickness flap was sutured in that position, and the sutures were removed 10 days postoperative (Fig 9e).

The surgical procedure facilitated the reestablishment of the new dentogingival complex at a more apical position to simultaneously reduce the periodontal pocket depth and the excessive gingival display (Figs 9f and 9g).12, 17–25

Clinical procedures: Restorative

Lithium disilicate material was chosen to restore the maxillary anterior teeth, the maxillary posterior segment was restored with the Zirconia framework on implant abutments, and metal-ceramic was chosen for the mandibular right molar for mechanical reasons.26

The incisal margins of the longest teeth (12 and 22) were first reduced to the predetermined incisal length while accommodating pulpal chamber preservation (Fig 10). The contact points were prepared to enable the technician to easily close the cervical area with porcelain as planned on the realistic cast. To be more conservative, the preparations were strategically planned for the buccal application of veneers.

The remaining tooth structure was reduced using the same approach, thus removing tooth struc-
ture in the least invasive and most controlled manner (Fig 11). Final impressions were made and all information was transferred to the laboratory to realize the posterior segments for the occlusal and esthetic try-in. At this point, the teeth were prepared for the veneers and a pickup impression was carried out to finalize the anterior restorations together with the posterior areas (Fig 12).

The veneers were fabricated using lithium disilicate material following the manufacturer’s recommendations (Fig 13). Each restoration was assessed for proximal contacts, occlusal relationships, shade matching, and marginal adaptation and was then luted in place (Variolink Veneer, Ivoclar Vivadent). The soft tissues and restorations have remained stable for 5 years and reflect the periodontal-restorative treatment.

Fig 12 Final impression for anterior veneers. The posterior crowns were incorporated into the silicone. Note the gentle finish line sliding in the displaced crevicular area. The cervical preparation area was on the radicular portion, as previously planned on the realistic cast.

Fig 13 Veneers completed and ready for cementation. The cervical area was built with monolithic ceramic while the remainder of the restorations had porcelain veneered on the core.
previously planned on the realistic cast (Figs 14 and 15). In addition, the teeth were properly positioned in the lip frame to enhance the patient’s smile (Fig 16).

**Conclusions**

This case demonstrated the importance of using a predetermined protocol and comprehensive diagnostic information to manage esthetic compromises that resulted from advanced periodontal disease, while also improving the health of the dentogingival complex. The
peridontal-restorative procedures implemented for this patient allowed the clinician to predictably accomplish the desired soft tissue remodeling while respecting the biologic width and the patient’s esthetic expectations.

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References