Surgical template for crown lengthening: A clinical report

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Surgical lengthening of clinical crowns represents one of the most commonly used procedures in contemporary periodontics. Indications include: (1) lack of sufficient length of a clinical crown to ensure a tooth preparation for fixed prosthodontics with retentive and resistance form; (2) preexisting dental caries or restorations in the vicinity of the free gingival margins that prevent preparation of finish lines for restorative margins coronal to the biologic width; (3) the need to develop a ferrule for pulpless teeth restored with posts[1,2]; and (4) unesthetic gingival architecture as a result of altered passive eruption.[3]

The classic research by Gargiulo et al[4] in 1961 defined the "dento-gingival junction" as 3 distinct components: gingival sulcus, junctional epithelium, and connective tissue attachment. The dentogingival junction was later redescribed as the "biologic width" by Cohen as the sum of junctional epithelium and connective tissue attachment.[5] This biologic width averaged 2.04 mm, whereas the mean sulcular depth was 0.69 mm. Despite the inordinate standard deviation and the limited sample size in the study by Gargiulo et al,[4] these numbers have been used as guidelines for decades in clinical practice to determine the extent of bone resection necessary to establish a biologic width.

The soft tissue coronal to the osseous crest includes the biologic width and free-gingival margin and has been described as the "dentogingival complex" by Kois[6] and the "supracrestal gingival tissue" by Smukler and Chaibi.[7]

Recent reports have indicated that there is considerable intraindividual and interindividual variability to the supracrestal gingival tissue.[8] Therefore, the supracrestal gingival tissue must be estimated for each patient and at each surgical site when surgically recontouring the alveolar bone. Preoperative "sounding" of the alveolar crest at a surgical site should be accomplished to estimate the osseous contour and supracrestal dimension of the gingival tissue (Fig. 1).

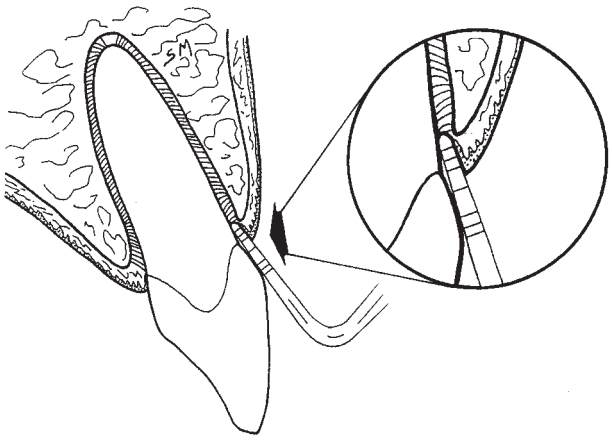

Fig. 1. Osseous contour and height of supracrestal gingival tissue estimated by "sounding" to bone with local anesthesia.

Nevertheless, it may be difficult to apply the information that was gathered preoperatively during the surgical intervention. Bragger et al[9] reported a gingival margin at the original preoperative level for 20% of the teeth in their study that had received surgical crown lengthening, and 2.5% were more coronal to the baseline. This finding was probably the result of inadequate bone recontouring and lent credence to the need for more definitive guides for the periodontist when performing crown-lengthening procedures.[10] The dentist will usually prepare the finish lines of the tooth preparations for artificial crowns and place provisional restorations before surgery, and these prepared finish lines can serve as surgical guides. However, anatomic conditions, such as severe occlusal abrasion of the teeth, may not permit adequate retentive and resistance form for provisional crowns. In those clinical situations, the periodontist must determine the adequacy of the bone resection for the final restorative plan. Insufficient bone may be removed or the periodontist may sacrifice more bone than is necessary. Either outcome can result in future problems for the restorative dentist.

This clinical report describes a patient treatment with a surgical-guide template that has been developed to facilitate surgical planning and enhance communication between periodontist and restorative dentist.

CLINICAL REPORT

A 65-year-old white man, with a history of pharmacologically controlled hypertension, was examined at

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J Prosthet Dent 1999;82:253-6.

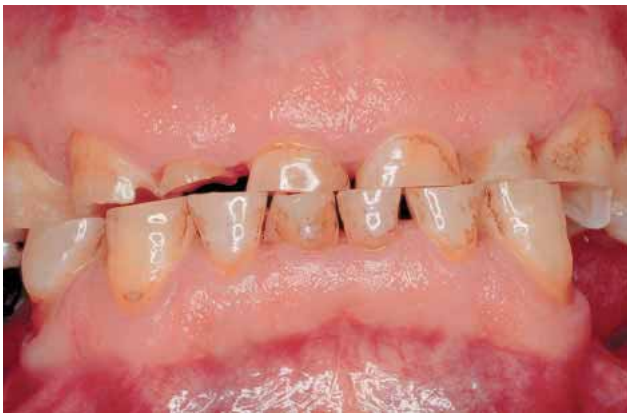

Fig. 2. Generalized tooth abrasion and lack of posterior support.

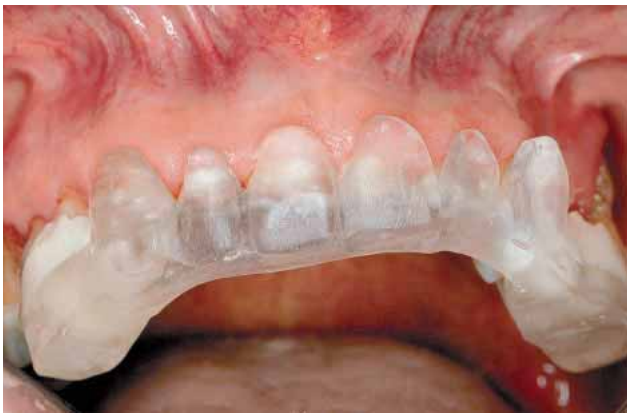

Fig. 4. Template intraorally with desired contour and position of finish lines for future artificial crowns.

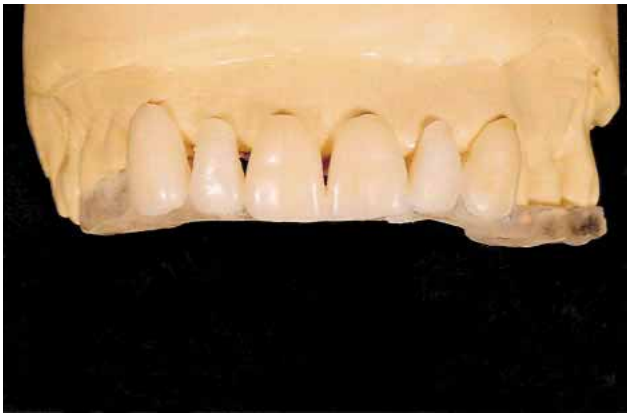

Fig. 3. Artificial teeth arranged to determine contour and dimension of planned artificial crowns.

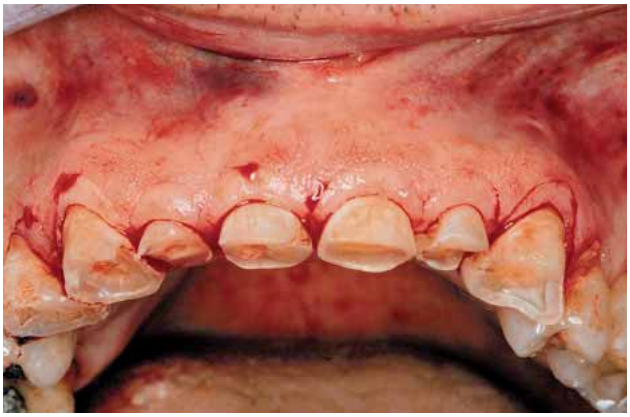

Fig. 5. Surgical incision follows scalloped gingival termination of template.

Boston University, School of Dental Medicine for treatment. The chief complaint was related to his esthetic appearance and functional disability. His problems were the result of lack of posterior occlusion and generalized severe tooth abrasion (Fig. 2). The patient described untreated nocturnal bruxism. Planned treatment included complete restoration of the maxillary anterior teeth with metal ceramic crowns and maxillary and mandibular removable partial dentures. Dental implants or complete crown restorations for the mandibular anterior teeth were not treatment planned because of financial constraints.

Surgical crown extension was necessary to expose additional tooth structure to proceed with restorative treatment. Analysis of the smile-line revealed excessive gingival display because of compensatory passive eruption that occurred with severe tooth abrasion.[11] Flat and thick type of gingiva was noted.[12] Diagnostic waxing was accomplished and a transparent acrylic resin template was fabricated with the use of stock artificial teeth to anticipate contour and dimensions of future artificial crowns (Fig. 3).

The template was trial seated intraorally to ensure stability (Fig. 4). Sounding of the alveolar crest was accomplished at this visit, under local anesthesia, with a XCPNCU15 probe (Hu-Friedy Co Inc, Chicago, Ill.) to determine the height of supracrestal gingival tissue, which averaged 4 mm. A facial scalloped surgical incision was outlined 2 mm submarginal, following the surgical template from maxillary left canine to right canine (Fig. 5). The palatal incision was 3 mm submarginal and paralleled to the crestal bone. After reflection of the mucoperiosteal flap and degranulation, the alveolar crest was compared with the template (Fig. 6).

From analysis of the template, it was obvious that the position of the alveolar crest was already 3 mm from a future finishing line for the planned restoration of the right canine, and only minimal ostectomy was necessary for remaining anterior teeth. Bone recontouring, both facially and palatally, was initiated with

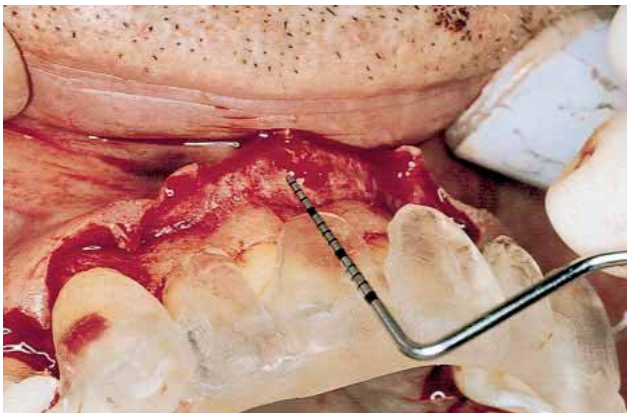

Fig. 6. Alveolar crest compared with template.

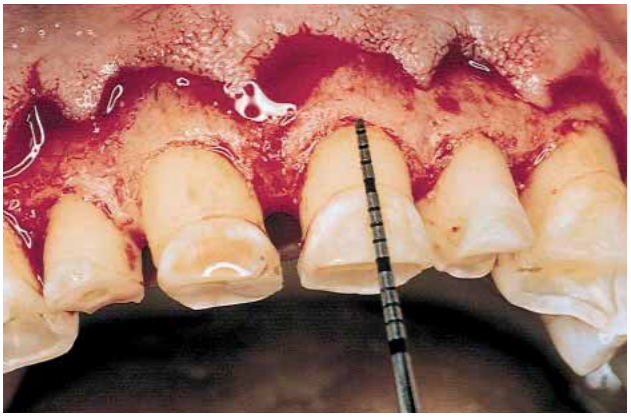

Fig. 7. Minimal ostectomy was required to develop desired results.

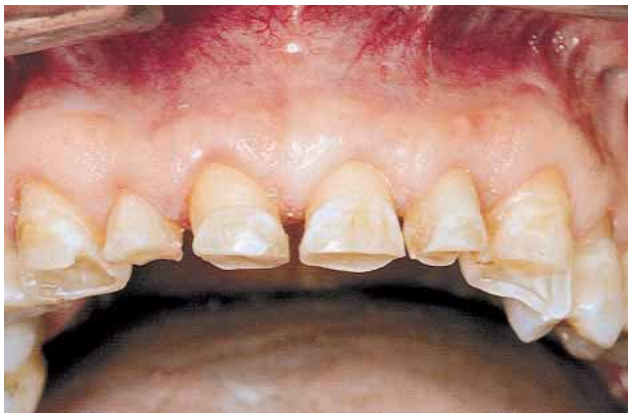

Fig. 8. Healing after 10 weeks.

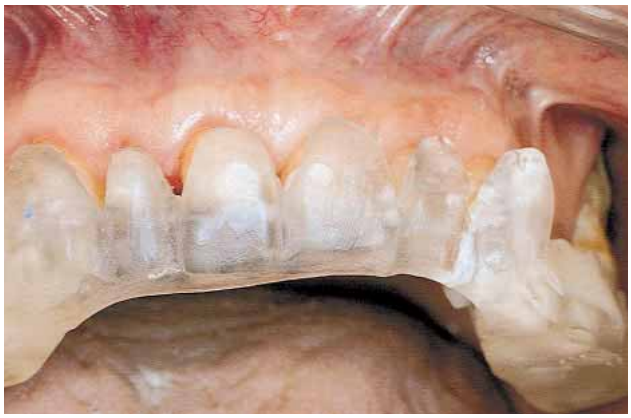

Fig. 9. Surgical results verified with template.

the use of a round diamond stone (023, coarse, Brasseler USA, Savannah, Ga.) mounted on a high-speed handpiece with copious water irrigation, followed by contouring with hand instruments (Fig. 7). The surgical template was reseated after ostectomy to reevaluate the results. After the planned dimensions were achieved, the flap was sutured with 4-0 silk vertical mattress interrupted sutures. A nonsteroidal antiinflammatory drug was prescribed (Lodine, 400 mg, twice daily) and postoperative instructions detailed. The patient was instructed to rinse with chlorhexidine 0.12% mouthwash until mechanical removal of plaque was resumed. Healing was uneventful (Fig. 8), and after 10 weeks the surgical results were verified with the template. The location of gingival margins was slightly apical to the cervical area of the acrylic resin template in the originally planned position (Fig. 9).

DISCUSSION

Osseous resective surgery for clinical crown extension is an irreversible procedure that commonly requires the reduction of supporting bone. A strategic plan of bone recontouring must be programmed to achieve a satisfactory and biologically acceptable result. A diagnostic waxing is essential and used as a guide to fabricate a surgical template. Many factors must be considered when crown lengthening is contemplated, such as root form and dimension, position of adjacent teeth, furcations, anatomic factors, gingival characteristics, and proximity of roots. The template may assist the restorative team to analyze limiting factors and may be modified as a radiographic template to visualize the amount of root would remain in bone after the surgery. Anatomic determinants such as gingival architecture and consistency and individual supracrestal gingival tissue must be previously recorded and may limit bone recontouring. The surgical template described has proven extremely useful in specific situations.

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Noteworthy Abstracts of the Current Literature

Selection of restorative materials, reasons for replacement, and longevity of restorations in Florida
Mjor IA, Moorhead JE. *J Am Coll Dentists 1998;65:27-33.*

Purpose. This study evaluated information from Florida dentists regarding types of restorative materials used in replacing existing restorations and placing new restorations, the reason for replacing restorations, and the age of replaced restorations. The focus was on different reasons for replacement for materials used in Class I and II restorations.
Material and methods. Two groups of dentists were asked to participate in a survey that involved demographics and background information about their professional history. A series of codes relating to placement of initial restorations and replacement restorations were developed and distributed to participants for their use during the survey period. Starting on a specific date, participants were asked to consecutively record all restorations placed and replaced and their age, gender, tooth treated, and type of restoration. The reason for placement or replacement of the restorations was noted using the codes and the materials of the new and old restorations and their age.
Results. Twenty-seven clinicians placed 2035 restorations of which 53% were replacements for failed restorations. Although amalgam continues to be the most popular restorative material, the increased use of resin-based restorative material was clearly evident, including posterior composites. Clinical diagnosis of secondary caries was the most common reason for replacement of amalgam (56%) and composite (59%) restorations. Only discoloration showed a significant difference in the reason for replacement of the 2 types of materials. Median age of the replaced amalgam restoration was 15 years and that of composite restoration was 8 years.
Conclusion. Although no specific conclusions were reached, the authors pointed out the need for clinical trials or follow-up studies to determine the efficacy of repair versus removal of faulty restorations. 23 References. —*ME Razzoog*