Clinical Showcase

Clinical Showcase is a series of pictorial essays that focus on the technical art of clinical dentistry. The section features step-by-step case demonstrations of clinical problems encountered in dental practice. This month's article is by Dr. Glenn van As. If you would like to propose a case or recommend a clinician who could contribute to Clinical Showcase, contact editor-in-chief Dr. John O'Keefe at jokeefe@cda-adc.ca.

Osseous Recontouring with the Er:YAG Laser to Obtain Ideal Biologic Width

Glenn van As, DMD

General dentists often face difficult treatment decisions that involve full-coverage restorations for teeth that already have existing restorations of substantial size and depth. These pre-existing restorations may encroach upon the biologic width, and the practitioner may thus need to consider various options for placement of the final restoration margin. For example, the margin might be placed equigingivally or supragingivally on existing restorative materials; the final subgingival margin could be placed on solid tooth, thus infringing upon the biologic width; or the margin could be placed subgingivally on solid tooth structure in conjunction with surgical alteration of the biologic width to a more suitable amount.

In the past, traditional treatment plans called for placement of a provisional crown and additional periodontal reduction of soft tissue and bone in the area encroaching on the biologic width. Sometimes, however, the need for additional periodontal surgery comes as a surprise to both the patient and the dentist, and the dentist may find it awkward to discuss the need for additional appointments or referral to a periodontist. In these situations, extra appointments may be required to restore the tooth to optimum function and the patient may incur additional cost for the treatment.

In such cases, the crown must be lengthened to achieve ideal biologic width and thus prevent the chronic inflammation that may occur with subgingival margin placement of the final restoration, which can be both unsightly and uncomfortable. Traditional methods of creating optimal biologic width have involved flap surgery in conjunction with removal of bone (osseous recontouring) to establish a minimal space of approximately 3 mm between the restorative margin and the bone.

More recently, hard-tissue lasers (Er:YAG [erbium yttrium aluminum garnet] and Er,Cr:YSGG [erbium and chromium yttrium scandium gallium garnet] wavelengths) have been developed to safely cut enamel, dentin, cementum and bone. Clinicians are also using these lasers as alternatives to handpieces for the removal of osseous tissue during the crown-lengthening phase. Lasers represent a reasonable alternative to traditional handpieces and perhaps offer additional benefits in terms of reduced bacterial contamination during surgery, increased visibility with reduced water splash, and similar or faster healing.

In some instances, the need for osseous recontouring is very localized and specific, perhaps on only one surface of a tooth. This limited need for recontouring may occur around deep subgingival restorations, when the caries is localized to one surface of a tooth or with subgingival cuspal fractures. In these cases the end-cutting hard-tissue lasers can be used for localized osseous removal without raising a flap. In allowing for careful removal of osseous tissue in a closed-flap situation, it is possible to generate an ideal biologic width for the final restoration and to complete the impressions for the indirect restoration all in the same appointment.

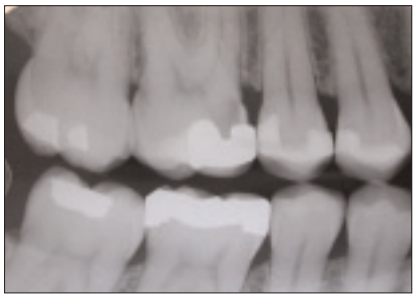

Figure 1: *Bitewing radiograph showing large secondary carious lesion on mesial aspect of tooth 16.*

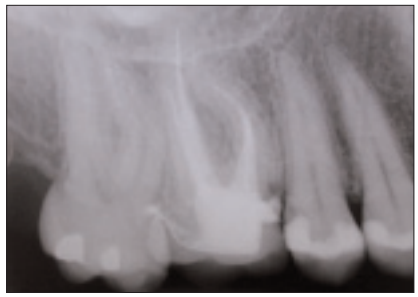

Figure 2: *Periapical radiograph showing completed endodontic treatment of tooth 16.*

Figure 3: *Tooth 16 before preparation for full-coverage porcelain-fused-to-metal crown.*

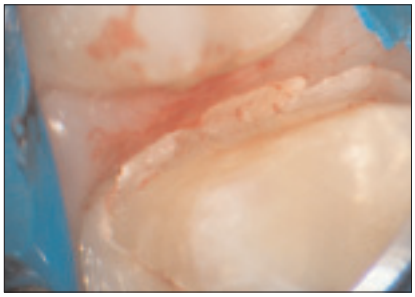

Figure 4: *Crown preparation in progress; the mesial margin is still on the composite.*

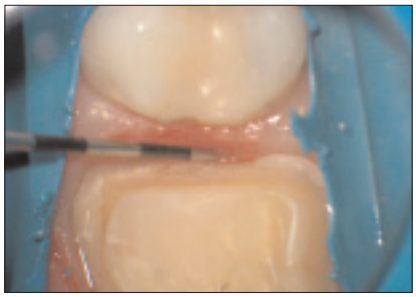

Figure 5: *Probe indicates subgingival location of the mesial margin, which infringes on the biological width.*

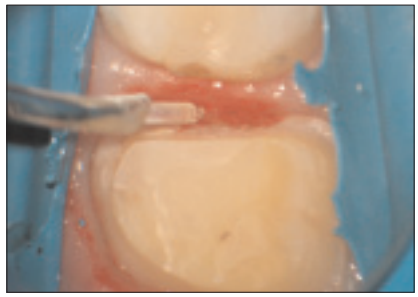

Figure 6: *Osseous recontouring with Er:YAG laser (400 micron tip).*

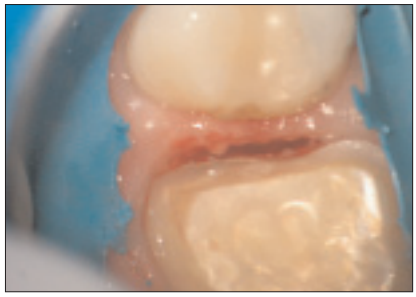

Figure 7: *Osseous recountouring completed (setting for laser: 30 Hz, 100 mJ, with water).*

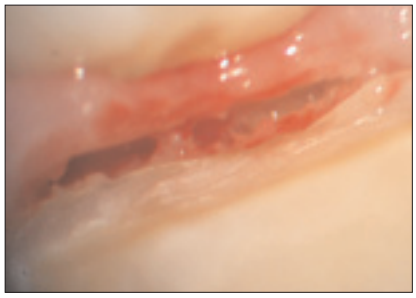

Figure 8: *High-magnification view of osseous recontouring site (16×).*

Figure 9: *With 3 mm of biological width restored, the soft-tissue laser is used for gingival troughing and coagulation.*

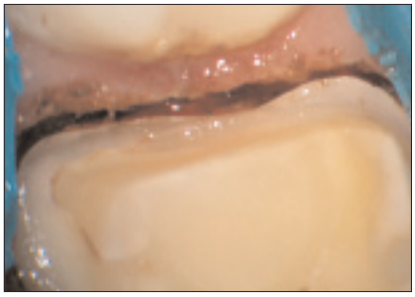

Figure 10: *High-magnification view of mesial aspect of tooth 16 once troughing is complete (16×).*

Figure 11: *Preparation of tooth 16 complete and ready for impression.*

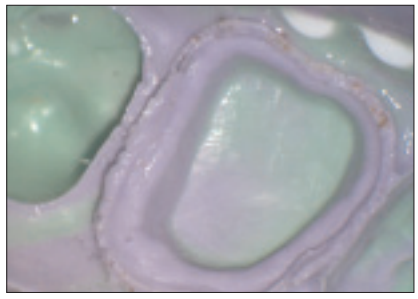

Figure 12: *Low-magnification view of completed impression (10×).*

The author cautions clinicians to contemplate closed-flap osseous surgery only in cases where localized or minor osseous recontouring is necessary. Suitable sites for such surgery would include areas next to a pontic site or an extraction site, as well as the buccal or lingual surface of a tooth. High magnification imaging allows the clinician to see precisely the amount of bone to be removed. The clinician should use caution in performing closed-flap procedures if the patient has any pre-existing periodontal disease in other areas of the mouth.

The main difficulty with closed-flap osseous recontouring is reduced visualization of the interaction of the end-cutting laser with bone; furthermore, unwanted iatrogenic vertical defects may be produced. For cases involving circumferential bone relief on one tooth, or if there are multiple teeth requiring treatment, the author recommends that use of the laser in a full open-flap surgical procedure be considered. The visibility afforded by full open-flap osseous surgery allows the clinician to visualize the parabolic architecture of the bone, prevent unwanted vertical defects, establish the ideal biologic width through creation of ledges or bone fragments, and maintain crucial amounts of attached keratinized tissue. However, once the clinician has performed open-flap surgery, there is a mandatory healing period of 8–12 weeks before final impressions of the preparation can be taken for the laboratory to fabricate the final restoration.

Figure 13: *Occlusal view of provisional crown on tooth 16.*

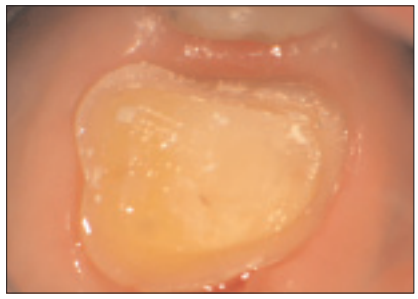

Figure 14: *Low-magnification view of preparation following removal of provisional crown on tooth 16 (10×).*

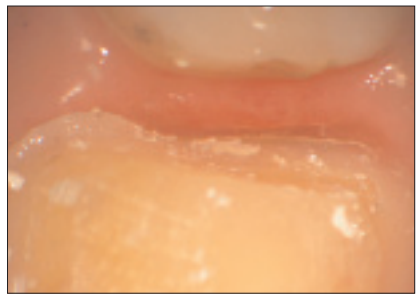

Figure 15: *High-magnification view of the mesial aspect of tooth 16. Note the good periodontal healing (16×).*

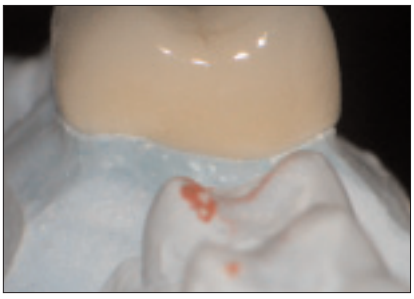

Figure 16: *Mesial view of porcelain-fused-to-metal crown of tooth 16 on the die.*

Figure 17: *Occlusal view of the inserted crown.*

Figure 18: *Labial view of crown inserted on tooth 16.*

Figure 19: *Occlusal view of crown 3 months after insertion.*

Figure 20: *Labial view of crown 3 months after insertion.*

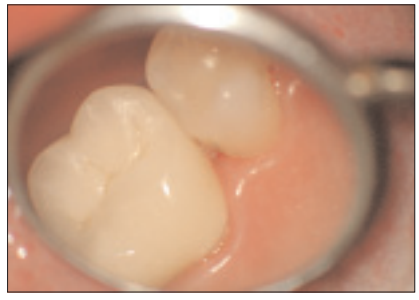

Figure 21: *Mesial indirect view of crown 3 months after insertion.*

In the case illustrated here, the clinician created an ideal biologic width for a single crown using an Er:YAG laser under high magnification (16× power with the dental operating microscope) in a closed-flap procedure performed on the same day that final impressions were taken for the restoration. Healing was ideal, and the patient was spared a long period of healing between the surgical and restorative phases of treatment. ◆

Further Reading

Click here to view the Further Reading list.

Dr. Glenn A. van As *maintains a private practice in North Vancouver, B.C. Dr. van As is the acting president of the Academy of Microscope Enhanced Dentistry (www.microscopedentistry.com) and a member of the Academy of Laser Dentistry (www.laserdentistry.org).*

Dr. van As *is one of the presenters at the Academy of Laser Dentistry's 12th Annual Conference and Exhibition to be held in New Orleans, Louisiana, April 6–9, 2005.*

Dr. van As *receives an honorarium for lectures from Global Surgical Corp. (microscopes) (www.globalsurgical.com) and Hoya Con Bio (lasers) (www.conbio.com) and has been on faculty for which he receives honorariums from the Institute for Laser Dentistry (www.laserdentistry.ca).*

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