

Point of Care

The Point of Care section of JCDA answers everyday clinical questions by providing practical information that aims to be useful at the point of patient care. The responses reflect the opinions of the contributors and do not purport to set forth standards of care or clinical practice guidelines. Readers are encouraged to do more reading on the topics covered. This month's responses were provided by members of the Canadian Academy of Restorative Dentistry and Prosthodontics. If you would like to submit or answer a question, contact editor-in-chief Dr. John O'Keefe at jokeefe@cda-adc.ca.



Question 1 How can I remove fixed prostheses effectively?

Fixed partial dentures have a limited life expectancy and will eventually need modification or replacement for esthetic, functional, mechanical or biological reasons. If the prosthesis can be removed without damage, the appropriate modifications can be made and the prosthesis resecured; however, removing a fixed prosthesis without damaging it can be difficult.

In one common clinical scenario, one abutment of the prosthesis has lost its cemented integration and the other is secure. To remove the prosthesis safely in this situation, the portion of the prosthesis that is not secure must be supported, so that all removal forces can be directed along the long axis of the prepared teeth in the section of the prosthesis that is still secure. This means that the loose portion of the bridge must be compressed onto its abutment while the removal force is concentrated on the secure abutment. In this way the forces are kept vertical and have little rotational vector. Several instruments are available that produce appropriate magnitude and direction of force, as described below.

The Richwil crown and bridge remover (Almore International Ltd., Portland, Ore.) (Fig. 1) makes use of sticky wax that is warmed and then placed on the biting surface of the prosthesis. The patient closes his or her teeth into the wax, which is then allowed to cool. Once the wax has hardened, the patient opens his or her mouth with a sudden motion. In most cases, the resulting force breaks the

cement seal. This method works well on temporary cements, but clinicians must be aware that nonsecure teeth of restorations in the opposing arch may be dislodged during the opening action.

The manual back action hammer (Fig. 2) makes use of a "hook" placed under the prosthesis and a weight that slides on a rod. This device works well on prostheses that have been secured with temporary cements. Although it can produce adequate force to loosen the prosthesis, ensuring that its direction is correct is more difficult: whenever the weight is activated, the rod can be easily shifted away from the axis of removal.

The spring-loaded back action hammer (Bontempi, Toronto, Ont.) (Fig. 3) allows removal forces to be created in a more directed fashion. Compressing the bridge remover to 1 of 3 levels activates the device. When the lever is depressed, the spring-loaded weight that produces the counterforce "taps" off the prosthesis. For reactivation, the device must be removed, reloaded, repositioned and then reactivated.

The air-driven bridge remover (Dentco Corp. USA, White Plains, N.Y.) (Fig. 4) makes use of the compressed air in the dental unit to activate an internal counterweight. When the purchase point is placed under the bridge, the activation button is released to a preset amplitude. Reactivation is automatic by virtue of the compressed air

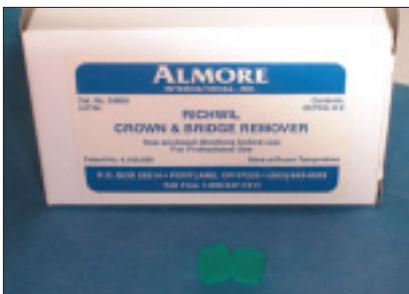


Figure 1: The Richwil crown and bridge remover works well for removing provisionally cemented prostheses.

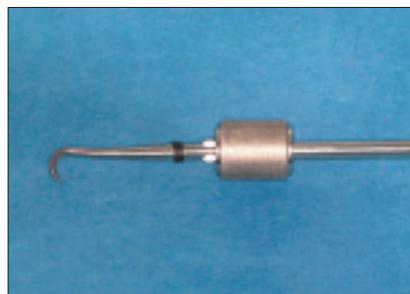


Figure 2: The manual back action hammer is the classic method for removing prostheses. It produces the desired force by means of a weight that slides along a shaft.



Figure 3: The spring-loaded back action hammer allows forces to be directed in a more controlled manner.



Figure 4: The air-driven (pneumatic) bridge remover allows force to be delivered repeatedly in a short period of time without removal of the device from the mouth.



Figure 5: Use of the Higa bridge remover involves cutting a perforation into the occlusal surface of the crown. The device is then supported on the underlying abutment tooth so that the forces are directed only to the prosthesis.

flowing into the unit. Directional control is simple because the clinician's hands and fingers need not be repositioned.

The Higa bridge remover (Higa Manufacturing Ltd., West Vancouver, B.C.) (Fig. 5) is based on a cable system, which pulls up on the bridge while a support peg holds down the prepared tooth. This procedure involves preparing an access channel in the cemented abutment and placing a support peg into it. A cable is wrapped around the prosthesis, and a turning post is used to turn and tighten the cable. This action lifts the prosthesis while the underlying abutment is held in position and is prevented from moving.

Once the bridge has been removed, it can be recemented and the access channel filled in an appropriate restoration.

Removal of a fixed bridge is an integral part of prosthodontics. The situation arises in the presence of long-span bridges and prostheses that are supported by less-than-ideal crown preparations. A clear understanding of the methods

used to remove prostheses is vital to those practising crown and bridge prosthodontics. ♦



Dr. Izchak Barzilay is head, division of prosthodontics and restorative dentistry, Mount Sinai Hospital, Toronto, Ont., and assistant professor, faculty of dentistry, University of Toronto, Toronto, Ont. He also maintains a private practice in prosthodontics in Toronto.

Dr. Barzilay has no declared financial interests in any company manufacturing the types of products mentioned in this article. E-mail: ibarzilay@tdc.on.ca.

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Question 2

What is cervical external root resorption and how can it be managed?

The cause of external inflammatory root resorption is unknown. The condition can be described as a process whereby an unprotected, locally destroyed or altered root surface becomes susceptible to resorbing clastic cells during an inflammatory response of the periodontal ligament to a “stimulus,” causing destruction of the ligament and a bowl-shaped invasion of cementum and dentine in the cervical region of the root by resorptive fibrovascular tissue. Trauma (in the widest sense of the word) is the most commonly associated factor with this “stimulus.”

Any patient is at risk, but invasive cervical resorption is relatively uncommon. When the lesion is visible, the clinical features vary from a small defect at the gingival margin to a pink coronal discolouration of the tooth crown. Inflammation adjacent to the resorptive defect can cause the patient to complain of discomfort when the affected

oral mucosa is palpated by the finger and rubbed against by the tongue (Figs. 1a and 1b). More often there are no external signs — diagnosis is often by chance observation of a routine radiograph. Aggressive subgingival probing will confirm the presence of the lesion (Figs. 2a and 2b).

Definitive treatment depends on which tooth is affected, as well as location and severity of the defect. Conservative treatment is desirable, but may not be possible because of the infiltrative nature of the pathology or late diagnosis. Treatment aims are to inactivate clastic cell activity within the resorptive defect and to provide a suitable environment to restore the tooth to satisfy proven biological principles.

Heithersay reports a conservative treatment of flap reflection, curettage, topical application of trichloroacetic acid (90% aqueous solution) and restoration of the defect with glass ionomer and composite resin. Trichloroacetic



Figure 1a: This patient complained of gingival irritation on the facial side of tooth 21. The defect was obvious on probing and can be clearly seen on the radiograph.



Figure 1b: Root canal treatment was performed. Subsequently, a flap was raised and a glass ionomer restoration veneered with a composite resin was placed that violated the biological width. Aggressive periodontal care was required to maintain periodontal health. The radiograph, taken 9 years later, shows 1–2 mm of alveolar bone loss.



Figure 2a: This patient's chief complaint was discomfort when the tongue touched the lingual gingival tissues of tooth 27. The faint radiolucency apical to the pulp chamber was missed by the general practitioner and the prosthodontist. Aggressive probing by the endodontist helped detect the lesion.



Figure 2b: Root canal treatment was performed. The postoperative radiograph taken a few weeks later demonstrates where the lesion was in relation to the partial super-imposition of the pulp chamber.

the condition may have a recurrence in the same tooth if treatment is not aggressive enough. Or the recurrence may occur in other teeth. At recall, the dentist should perform a very thorough subgingival probing of the cervical circumference of each tooth, noting irregularities in gingival contour; do a finger palpation of the overlying mucosa, both facially and lingually; and take radiographs as required. Treatment should minimize damage to the cementum and periodontal attachment apparatus. Post-treatment gingival margin inflammations should be investigated promptly. ♦

acid is a very caustic agent that will produce coagulation necrosis when applied to soft tissues. It does provide moisture control and etches dentine and enamel, but can also result in a chemical gingivectomy, unless used with extreme caution.

Conservative treatment problems are visualization of the lesion because of difficult access and bleeding, control of the hemorrhage from the highly vascularized resorptive tissue, removal or inactivation of the lesion, retention form of the cavity design and control of moisture contamination from basic restorative materials. Subgingival restorations violating the concept of biological width will cause future periodontal complications. Conservative treatment may not be possible because of late diagnosis. An aggressive lesion will require aggressive treatment, namely root canal therapy, crown lengthening, and post/core and crown.

It is not possible to predict or prevent the occurrence of inflammatory cervical root resorption. Patients affected by



Dr. Barry J. Hood maintains a private practice in general dentistry in Toronto and is an associate in dentistry (Qualifying Program), faculty of dentistry, University of Toronto, Toronto, Ontario. barry.hood@sympatico.ca

Further Reading

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Question 3 How do you restore molars with buccal or lingual furcation involvement?

With loss of vertical bone, molars frequently develop furcation involvement. As the furcation becomes deeper horizontally, a cave develops that is superb for harbouring bacteria.¹ The rationale behind my preferred method of preparing and restoring such teeth is to remove the roof of the furcation, prepare very broad, deep grooves and enhance the patient's plaque control.

Three issues must be addressed in planning treatment in such cases:

- horizontal pocketing into the furcation
- vertical bone loss around the furcation
- relationship of the pulp chamber to the furcation.

The horizontal pocket is best measured with a curved periodontal probe such as a Nabers PQ2N probe (Hu-Friedy, Chicago, Ill.). Although periapical radiographs are excellent for visualizing the vertical bone loss of lower molars, vertical bitewing radiographs are better for demonstrating bone levels of the upper molars, especially if the film is not pulled close to the lingual surfaces of the teeth.

According to Ricchetti,² the pulp chamber occupies the middle third of the tooth. This anatomic information enables the clinician to judge whether or not endodontic treatment will be required before the roof of the furcation is removed during tooth preparation.

Ricchetti's furcation classification system divides the molar into buccal, middle and lingual thirds. The classifications are as follows:

- Class I: incipient involvement; horizontal involvement just into the interradiolar area
- Class Ia: involvement into approximately the first half of the buccal or lingual third
- Class II: horizontal involvement beyond Class Ia, but not into the middle third of the molar
- Class IIa: horizontal involvement into the middle third of the molar, but not beyond halfway
- Class III: horizontal involvement beyond half of the tooth width (Fig. 1).

When assessing a furcation-involved tooth for full coverage, I initially use this classification to determine the proximity of the planned preparation to the pulp. After the roof of the furcation has been removed, preparation of Class I and Ia teeth can usually be completed with minimal trauma to the nerve. Class IIa preparations will likely cause irreversible pulpal damage, and Class IIa and Class III preparations will expose the pulp.

Class II preparations require greater judgement, and radiographic analysis of the size of the pulp and the amount of vertical bone loss is required. Class II preparation in the

presence of a large pulp or advanced vertical bone loss creates a greater risk of losing pulpal vitality.

Treatment

Classes I and Ia

1. I recommend initially cutting a typical shoulder bevel preparation. Next, probe the furcation with the tip of a long, tapered diamond and then re-position the diamond and barrel into the furcation until you cannot probe the furcation horizontally. Finally, smooth the slice preparation with a fine and then a super-fine diamond.
2. Design the crown to have a broad, deep groove from the furcation to the occlusal surface (Fig. 2).

Class II

1. The preparation and restoration are similar to those for Classes I and Ia. However, on the basis of probing and radiographic analysis, determine if pre-restorative endodontic treatment is appropriate. If there is doubt, I prefer to take a proactive approach and perform preventive endodontic treatment rather than risk drilling through a new crown soon after its insertion.

Classes IIa and III

1. Perform endodontic treatment.
2. Probe the furcation with the tip of a long, tapered diamond, then re-position the diamond upright and hemisect the tooth, removing all lipping in the furcation. Smooth both hemisected roots down with a fine and super-fine diamond.
3. Restore mesial and distal roots with post and core restorations.
4. Prepare each root with either a chamfer or a very conservative shoulder bevel.
5. Restore as 2 small splinted bicuspid (Fig. 3).

Additional Notes

1. Make the furcation preparation wide enough mesiodistally that the laboratory can make the buccal or lingual groove wide enough to facilitate home care (Fig. 4).
2. Draw a horizontal line on the die from the margin of the mesial root to the margin of the distal root, then finish the furcation margin as a slice at that line. This will prevent encroachment into the biologic width (Fig. 5).
3. Instruct the patient to maintain the gingival crevice by treating with chlorhexidine on a Sulcabrush (Sulcabrush Inc., Concord, Ont.) twice a day.
4. Create the provisional crown in the same way as the permanent crown. This allows the dentist to evaluate the

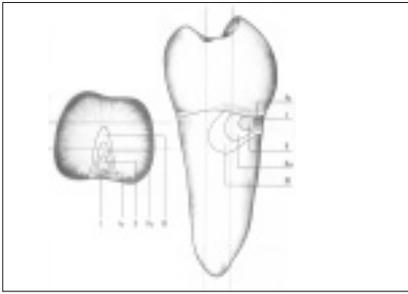


Figure 1: Cross-sectional and frontal section drawings of a lower molar, demonstrating the pocket configuration and bone loss generally seen with each classification of furcation involvement. Figure reprinted with permission from Quintessence Publishing Co, Inc.²



Figure 2: Wide, deep buccal grooves. Plaque control needs improvement.



Figure 3: An 80-year-old patient 7 years after insertion of 2 splinted crowns on hemisected roots.



Figure 4: Class I lingual and Class II buccal furcations.



Figure 5: Crown margin will be finished short of the prepared margin in the furcation.



Figure 6: Wax-up for furcation within a double-palatal root of an upper second molar.

patient's plaque control at final insertion and to provide any necessary advice regarding oral hygiene.

5. Long periodontally involved teeth are best finished with a fine chamfer or a slice preparation.
6. Check wax-up models until your laboratory is completely familiar with your requirements (Fig. 6).



Dr. Jeff Martin maintains a private practice in Toronto, Ontario. He has no declared financial interests in any company manufacturing the types of products mentioned in this article. E-mail: j.m.martin@sympatico.ca.

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Question 4 How can I use gingival retraction techniques to consistently maintain my patients' periodontal health and develop precise marginal integrity around full-coverage restorations?

In terms of our patients' long-term periodontal health, the success of any fixed prosthesis involves proper management of both hard and soft tissues.^{1,2} In this regard, a strong relationship has been documented between the chosen restorative procedure and the response of the surrounding periodontal supporting structures.³

Kois⁴ has developed guidelines for intracrevicular tooth preparation based on key anatomical predictors of the dentogingival complex (DC), the distance from the crest of the bone to the free gingival margin. Two key aspects of periodontal architecture play a role in determining margin placement. First, there is considerably more osseous scallop in the anterior region, which progressively flattens out posteriorly; this in turn mimics the scallop of the cemento-enamel junction.⁵ Second, there is biologic variation within the normal location of gingival levels, as described by Kois⁶: normal crest, DC = 3 mm; high crest, DC < 3 mm; and low crest, DC > 3 mm. It is therefore more practical to be aware of the position of the osseous crest when determining the final margin placement, especially in the anterior region.⁷ In particular, the most consistent predictors of margin placement, in areas of esthetic concern, are the distance from the crown margin to the osseous crest and, to a degree, sulcus depth. The latter is between 2 and 2.5 mm coronal to the osseous crest and provides for a normal crest situation with proper connective tissue and epithelial attachment.⁶ In general, a high crest poses a much greater risk of violating the biologic width, which can result in inflamed and cyanotic tissue; in contrast, with a low crest, facial recession and black holes are more likely.⁴

If the design of the preparation and esthetic considerations allow, a supracrestal margin placement is ideal for long-term hard- and soft-tissue health; in such cases, obtaining a clear, precise impression of the preparation is relatively uncomplicated.⁸ In the event of intracrevicular margin placement, the clinician needs to determine the

osseous crest type and the depth of the sulcus, then employ a consistent tissue management protocol. This protocol should be reproducible, predictable and time-efficient in order that the technician is provided with an accurate model of not only the preparation but also its root form (i.e., emergence profile).

The following tissue management protocol is recommended for intracrevicular tooth preparation:

1. Evaluate radiographically the position of the osseous crest (and scallop) and the apical extent of previous restorative margins.
2. After applying adequate local anesthesia, determine crest type by sounding the osseous crest with a periodontal probe #4 (Hu-Friedy, Chicago, Ill.).
3. Place a rubber dam, and then remove the old restoration, caries and unsupported tooth structure. Reconstruct the missing tooth structure with desired post and/or core material, and prepare the tooth for the type of restoration being provided.
- 4a. With a normal or high crest, first *lightly place* a #00 braided cord (UltraPak, Ultradent Products Inc., South Jordan, Utah), followed by a #0 braided cord; be careful not to overlap each cord on itself (Fig. 1). These 2 cords, when placed dry and undistorted in the sulcus using a plastic filling instrument (IPC-A, Hu-Friedy), should measure 1.5 mm in height; together with the connective tissue attachment of about 1.0 mm, they create a distance of 2.0–2.5 mm from the osseous crest.

Depending on the level of the tissue, a radiosurgical instrument (no. 113F, Ellman Int, Inc., Hewlett, N.Y.) can be used to perform a pressureless microsmooth tissue excision to expose the second cord (#0) at its coronal extension (Fig. 2). The full width of the cord should be clearly visible from all directions around the preparation (360°). The finish line can now be



Figure 1: Completed preparation with size #00 and #0 UltraPak cords in place.



Figure 2: Occlusal view of refined preparation after radiosurgery has been performed on the retracted tissue.



Figure 3: The appearance of the gingival sulcus immediately after removal of the #0 cord.

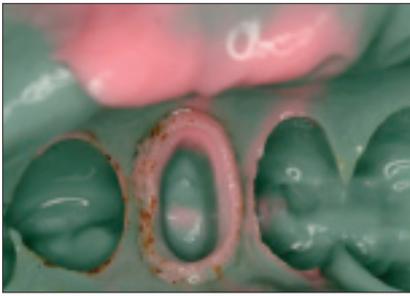


Figure 4: Reversible hydrocolloid impression with good marginal definition.



Figure 5: Facial view of preparation 3 weeks after the procedure, showing excellent healing of the marginal tissue.



Figure 6: Gingival response at insertion appointment, with all-ceramic crown in place.

established at the appropriate level: we now know where the marginal tissue will end up after the cords are removed and the tissue has healed.

Before removing the #0 cord, the tissue is rubbed with a hemostatic agent (Viscostat, Ultradent Products Inc.). The cord is removed gently and the entire area is rinsed thoroughly to remove any remaining Viscostat, to provide clear access for impression material (Figs. 3 and 4). The site is left either wet or dry depending on the type of impression material used.

- 4b. For low-crest situations in the anterior sextant, *extra-light* pressure is used to place a #00 cord followed by either a #0 or #1 cord; the cords must remain visible at the sulcus crest. No radiosurgery is indicated. In posterior regions where the clinician wants to reduce the pocket depth, proceed as for a normal crest.
5. This retraction technique yields consistently predictable soft-tissue results (Figs. 5 and 6). ♦

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Dr. Peter Taylor is a private practitioner and part-time clinical instructor in prosthodontics at the University of Western Ontario in London. He has no declared financial interests in any company manufacturing the types of products mentioned in this article. E-mail: taydent@aol.com.