# 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 speakers at the 2004 Ontario Dental Association Annual Spring Meeting, which will take place in Toronto, Ontario, from May 6 to 8. For more information on the meeting, visit www.oda.on.ca. 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

Following removal of a maxillary anterior tooth, what is your preferred method of provisionalization in preparation for an implant restoration?

The esthetic placement of a prosthetic tooth is highly influenced by the provisional restoration placed at the time of extraction. The provisional restoration must be inserted immediately following tooth removal to conserve the hard and soft tissues and to provide labial gingival tissue fullness and support to the papillae.

Provisional restorations may be removable or fixed and must be tooth-supported.[1,2] To ensure that the occlusion is not disturbed, it is usually necessary to remove tooth structure or restorative material in order to provide occlusal rest areas for a removable restoration, or to achieve retention for the fixed provisional restoration. This small biologic cost is outweighed by the enhanced esthetic results. To conserve the tissues, the functional forces must be applied to the teeth and not to the tissues, which would cause tissue loss and collapse.

My preferred method of provisionalization is the fixed provisional restoration, using an acrylic denture tooth affixed to the adjacent teeth.

### Procedure Highlights

1. Select an appropriate acrylic denture tooth as a replacement pontic for the tooth to be removed.
2. Measure the length of the tooth to be extracted from the incisal edge to the gingival crest and add 3 mm.
3. Atraumatically remove the tooth (**Figs. 1** to **3**).
4. Sculpt and shape the replacement acrylic pontic to fit esthetically into the edentulous region and extend 3 mm into the fresh extraction socket. It may be necessary to add self-cure acrylic to the gingival aspect of the pontic to obtain the clinical length plus 3 mm subgingival extension (**Figs. 4** and **5**). Shape the subgingival extension to resemble the extracted tooth's root form. The apical end should be egg-shaped, convex in all directions and highly polished. This subgingival extension will support the soft tissues (as did the natural tooth) and will provide the same labial fullness and papilla support. The extension will have an ovate pontic form.[3]
5. Roughen the proximal contact areas of the pontic and cut Class III preparations into the mesial and distal contact areas.
6. Using a #35 high-speed bur, cut 2 small Class III restorations into the contact areas of the adjacent teeth. If the tooth surfaces are intact, attempt to keep the preparations entirely in the enamel. If restorations are present, the preparations should be within the restorations.
7. Etch the proximal tooth surfaces.
8. Wet the etched tooth surfaces and the proximal pontic surfaces with methylmethacrylate monomer.
9. Apply self-curing acrylic to the 4 adjacent prepared and wetted regions. Acrylic — and *not* composite — should be used. Self-curing acrylic bonds to the acrylic denture tooth, is flexible, and will not crack and cause the pontic to dislodge with the slight movement of the supporting teeth.
10. Place the pontic into the socket in its proper orientation and extending 3 mm subgingivally, with the soft unset acrylic blending at the contact areas.
11. Hold the pontic in position until the acrylic has sufficiently set to maintain its position (**Fig. 6**). It may be necessary at this point to add more acrylic to the contact areas.

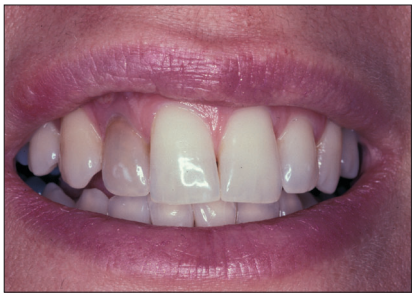

***Figure 1:*** *Tooth 12, with a history of trauma, endodontic therapy, apical surgery, an apical fistula and a vertical root fracture, needs removal.*

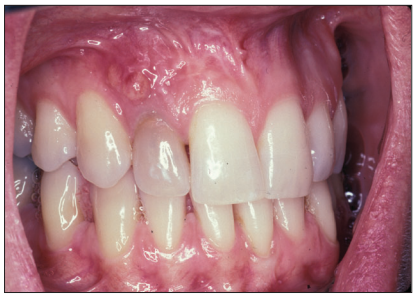

***Figure 2:*** *Labial fistula over the apex of the tooth.*

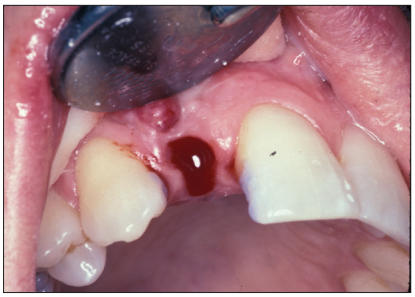

***Figure 3:*** *Tooth atraumatically removed.*

***Figure 4:*** *The acrylic denture tooth has been shaped and self-cure acrylic added to the apical end to form an ovate pontic, which will extend 3 mm subgingivally.*

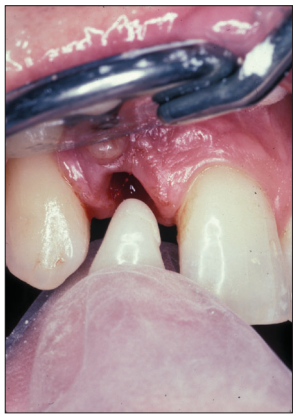

***Figure 5:*** *The sculpted ovate acrylic pontic is being positioned 3 mm into the extraction socket.*

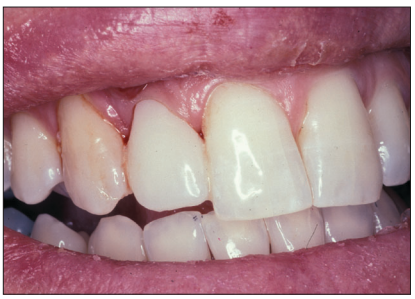

***Figure 6:*** *The ovate pontic is bonded to the adjacent teeth with self-cure acrylic on the day of extraction. The pontic is providing support to the papillae and the labial tissue, as did the original tooth.*

12. Contour the acrylic when it has fully set and adjust occlusion. A light centric contact and no contact in eccentric position is desired.
13. To allow surgical and restorative procedures, the pontic can be readily removed using a plastic medium-grit, safe-sided sandpaper disc, with the safe side adjacent to the teeth. Once the procedure is completed, the pontic can again be bound with self-cure acrylic.
14. Upon osseointegration of the implant fixture, restore the proximal preparations on the adjacent teeth with composite and use an implant-supported provisional restoration.

This fixed provisional restoration maintains tissue fullness and papilla height because of the root form extension into the socket. If at the time of extraction there is an absence of proximal bone or labial plate, the tissues will recede with time and may require reconstruction. ➧

***Dr. Robert David*** *is an associate professor at McGill University and practises restorative and implant dentistry in Montreal, Quebec. E-mail: bobbydavid@sympatico.ca.*

*Dr. David and Dr. Fredrick Muroff will be presenting "A Team Approach to Periodontal, Implant and Restorative Procedures for Gingival Aesthetics" on Thursday, May 6.*

## References

1. Burns, DR, Beck DA, Nelson SK. A review of selected dental literature on contemporary provisional fixed prosthodontic treatment. Report of the Committee on Research in Fixed Prosthodontics of the Academy of Fixed Prosthodontics. *J Prosthet Dent* 2003; 90:474–97.

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# Question 2 How should I manage acute limitation of jaw motion and pain after a dental procedure?

Acute limitation of mandibular motion after a dental procedure is most commonly caused by:

- elevator muscle strain;
- myositis associated with needle injury (resulting from mandibular block injections that enter the medial pterygoid muscle);
- articular disc displacement (ADD), which occurs when the disc physically obstructs normal mandibular movement.

While most dental procedures involve little or minimal postoperative discomfort, a small percentage of patients may experience discomfort that becomes severe enough to disrupt jaw function and cause pain, as well as considerable anxiety and stress.

It may be 1 or more days before the patient contacts the dentist to report symptoms that are not expected or not resolving. Because these symptoms are unexpected consequences of a procedure, the patient is often anxious and may feel that something was wrong with the way treatment was delivered. It is important to address the complaints as soon as they are reported. Effective communication can reduce anxiety that is often responsible for amplifying pain and increasing emotional distress.

Most of these postoperative problems relate to elevator muscle strain that can usually be managed medically over the course of 2 weeks without residual impairment or disability. Depending on the severity of the condition, myositis and muscle injury resulting from the anesthetic injection can be associated with fibrosis and a more persistent loss of mandibular motion. Articular disc displacement restricting jaw motion is a more persistent problem and usually does not resolve quickly.

The general approach to management should include:

1. arranging for the patient to return to the office as soon as possible;
2. performing an assessment to establish the most likely cause of the symptoms;
3. recommending a treatment plan that includes a time frame regarding expected results;
4. monitoring treatment and progress closely through frequent phone contact or office visits;
5. referring the patient for a second opinion or for further treatment if the patient expresses anger, emotional distress or loss of confidence; and
6. referring the patient if your treatment is not working and you are uncertain why or whether the diagnosis is correct.

## Patient Assessment

The following are some diagnostic clues that may help arrive at a diagnosis.

Elevator muscle strain:

- Maximum mouth opening is restricted but lateral mandibular movements are usually normal.
- Pain is often minimal or absent when the mandible is at rest.
- Assisted opening is greater than 5 mm compared to maximum unassisted opening. (To measure assisted opening, have the patient open as wide as possible, place the thumb on the maxillary central incisors and cross the index finger to the mandibular central incisors, apply moderate pressure without forcing the jaw and measure the interincisal distance.)

Myositis due to needle injury:

- Pain tends to be severe and is usually present when the jaw is at rest.
- The range of movement can be severely limited (sometimes less than 10 mm), making a thorough intraoral examination difficult or impossible.
- The extent of the limitation may not occur immediately but may increase during the several days after the procedure.
- Chewing ability can be severely limited, with the patient often reporting only being able to consume liquids.

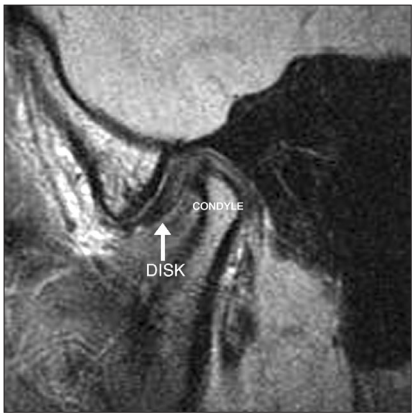


***Figure 1:*** *Magnetic resonance imaging of the mouth in the closed position showing the articular disc displaced anteriorly.*

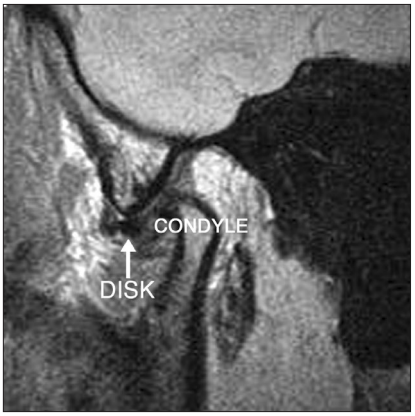


***Figure 2:*** *Magnetic resonance imaging of the mouth in the open position showing the disc remaining forward and not returning to a position between the 2 articulating surfaces.*

Articular disc displacement:

- Pain may be mild and limited to attempts to force the opening further.
- Mandible characteristically deviates to the affected side on opening.
- Mandibular movement to the opposite side is usually restricted.
- The mandibular condyle on the affected side is usually not palpable due to the lack of translation.
- Maximum assisted mouth opening is usually less than 5 mm.
- Magnetic resonance imaging can confirm this diagnosis (**Figs. 1** and **2**).

## Patient Management

The initial treatment strategy is to control pain, followed by a re-evaluation of mandibular motion. In some cases, especially if the diagnosis is elevator muscle strain, mandibular motion will return to normal and no further treatment will be necessary. When limitation persists, physiotherapy — including muscle stretching and joint mobilization, combined with home exercises that focus on increasing the range of jaw motion — is indicated.

To control pain:

- soft diet, heat applications, rest for the jaw;
- muscle relaxant medication (e.g., cyclobenzaprine, 5–10 mg at bedtime);
- analgesic medication such as a nonsteroidal anti-inflammatory drug (e.g., rofecoxib, 25 mg per day), or occasionally, in cases where myositis is present, a combination opioid with aspirin or acetaminophen may be required for short periods;
- physiotherapy, including massage and gentle stretching, as well as passive modalities such as ultrasound, heat, laser and transcutaneous electrical nerve stimulation (TENS).

After pain is reduced, if limited motion persists, a decision about active treatment to regain jaw motion can be made.

Significant limitation of jaw motion with pain persisting after a dental procedure may cause great anxiety and distress for the patient. To manage the condition successfully, treatment requires an active management plan that includes communication, reassurance and scheduled follow-up assessment. ◆

***Dr. Bruce Blasberg*** *is a certified specialist in oral medicine. He maintains a private practice in Vancouver, B.C., and is the director of the Orofacial Pain Program at Vancouver General Hospital. E-mail: b.blasberg@shaw.ca.*

*Dr. Blasberg's seminar "Diagnosis and Management of Temporomandibular Disorders (TMD) for the Dental Practitioner" will be presented on Friday, May 7.*

## Further Reading

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# *Question 3*

When instrumenting canals, does it really matter what size the canal is instrumented to? Should I aim to instrument to a large or a small master apical file?

In recent years, the trend in endodontics has been towards simplifying and speeding up the instrumentation and obturation of canals. Dental companies have concentrated their marketing efforts on one message: it can now take fewer files, less time and less effort to completely instrument canals. In fact, some of the newer and more popular rotary nickel titanium (NiTi) files do not even come in sizes larger than 30. Unfortunately, as is often the case, technology and clever marketing are dictating treatment instead of science.

The fundamental goal of endodontic treatment is to clean and debride canals and to eliminate intraradicular infection to achieve an aseptic intracanal field. This is achieved by 2 means: mechanical instrumentation with files and chemical disinfection with irrigating solutions such as sodium hypochlorite. These processes work concurrently to remove vital and necrotic tissue, bacteria, bacterial byproducts and dentinal debris created during instrumentation.

To determine final file size, one needs to keep in mind the size of the canal treated. If the goal is to clean and debride the canal, then the master file needs to be just slightly larger than the canal itself. In fact, evidence indicates that endodontic instrumentation should remove not only intracanal tissue and debris, but also part of the dentin wall surrounding the pulp. Because dentinal tubules are in direct communication with the pulp, any contaminants in the pulp will penetrate the dentin. Hence the need to remove as much of the affected dentin as possible. Underinstrumentation (**Figs. 1** to **3**) will result in

incomplete tissue or bacteria removal from inside the canal and surrounding dentin. The concept of removing all that is contaminated is a fundamental one, yet is all too often overlooked when deciding how to instrument.

No natural canal is perfectly round when examined in cross-section. Most canals are naturally oval and have anatomical aberrations, such as isthmuses or accessory canals that also need to be debrided. The file that is used should be large enough not only to debride the main canal, but also to mechanically instrument these aberrations. Anything less will leave behind undesirable tissue. For example, if the natural apical canal size of a maxillary lateral incisor is about 0.5 mm (equivalent to a size 50 file), then the master file size should be just correspondingly larger.

In addition to mechanical instrumentation, one needs to remember the significance of intracanal irrigation and disinfection with a solution such as sodium hypochlorite. Practitioners often forget or overlook the fact that canal irrigation with the use of irrigating needles is directly dependent on the size of the instrumented canal. With endodontic side-venting needles, the irrigant will go only about as far into the canal as the tip of the needle. The needle can only be placed apically as far as the instrumented canal will allow. That's just simple physics. In an underinstrumented canal, the needle and the irrigant will not reach the full length of the canal. This is one more reason to instrument larger.

Marketers' sales pitch of instrumenting with fewer files to a relatively small apical size in order to save time and effort means that the fundamental goal of endodontic treatment cannot be adequately achieved. Unfortunately, this can only lead to higher rates of clinical failure.

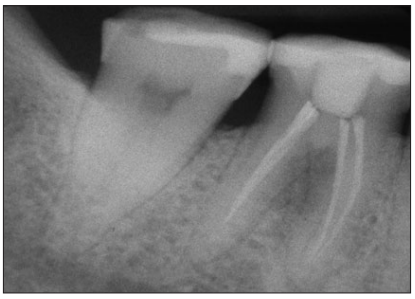

***Figure 1:*** *Failed root canal treatment. The canals had been underinstrumented.*

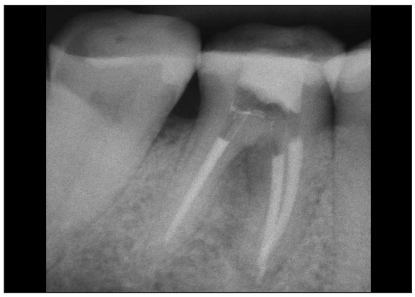

***Figure 2:*** *The tooth was successfully retreated and instrumented to a larger size.*

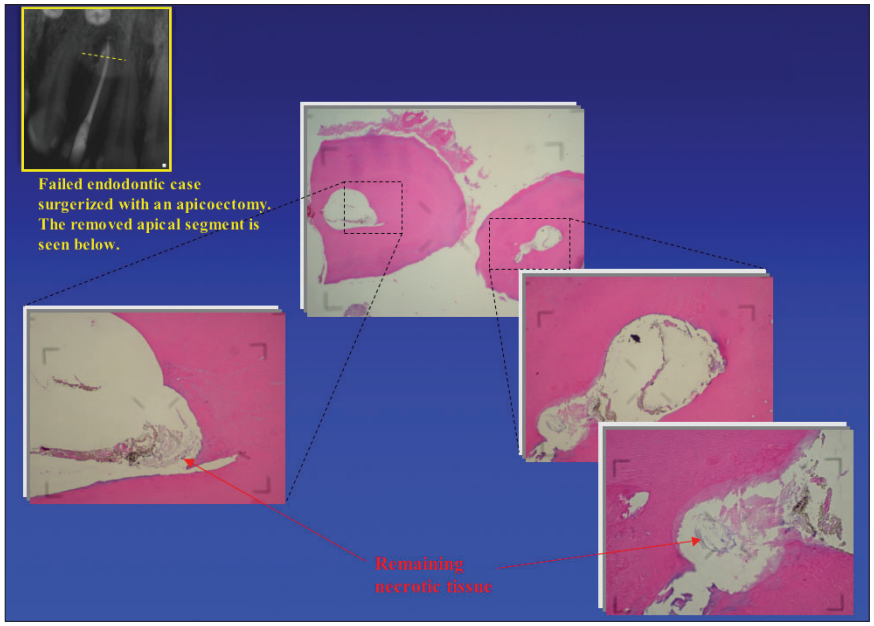


***Figure 3:*** *Histological cross-section of an underinstrumented canal with necrotic pulp left behind.*

## Further Reading

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***Dr. Manor Haas*** *is an oral and maxillofacial surgeon with a private practice limited to endodontics and microsurgery in Toronto, Ontario. He is a lecturer and clinic instructor at the University of Toronto's graduate and postgraduate endodontic departments. He is also on staff at Toronto's Hospital for Sick Children. E-mail : haasendo@mac.com.*

*Dr. Manor's seminar "Advances in Clinical Endodontics: What's New, What's Worth It, and How It May Enhance Your Endodontics!" will be presented on Friday, May 7.*

## Question 4

What is the cause of apical migration of the soft tissue attachment and subsequent alveolar bone resorption around an anterior implant within the first year of placement in the absence of peri-implantitis?

In an attempt to create an ideal emergence profile, implants are often placed 3–4 mm below the cemento-enamel junction of the adjacent teeth and traditionally countersunk below the crestal bone. Initially, a very esthetic restoration is created with 3–4 mm of subgingival metal or porcelain. However, this result is not always maintained in the long term.

After the first year of function, there is a mean bone loss of 0.8–1.0 mm. Once the abutment is connected, there can be another 1.1–1.5 mm of bone loss beyond the abutment connection.[1] There may therefore be a 5-mm (or deeper) pocket on the facial aspect and an even greater probing depth interproximally after the first year. As a result, anaerobic bacteria are more likely to develop in the sulcus. Regular oral hygiene is less effective at that depth. If the implant is countersunk below the crestal bone, the weak trabecular bone cannot resist functional loading, leading to faster bone resorption. In the long term, this will result in loss of soft and hard tissue, with a risk of the metal showing around the abutment and a flattening of the interdental papilla.

Loss of tissue around the submerged implant occurs because the biological width is violated. The biological width around a tooth is the combination of the supra-alveolar connective tissue attachment (1.07 mm) and the epithelial attachment (0.97 mm) with an additional sulcus depth of 1.0 mm.[2] It is generally agreed that for an implant, there is no direct attachment between the connective tissue and the titanium. However, there is a tight band of connective tissue around the implant that is considered important in preventing apical migration of the junctional epithelium. Biological width is nature's way of protecting the zone of osseointegration from bacteria and mechanical challenges to the oral cavity.

Experimental data have shown that a biological width does exist around implants. It is a stable structure, even after 15 months of loading (biological width of 2.94–3.08 mm), similar to natural teeth.[3] In a canine model, when the

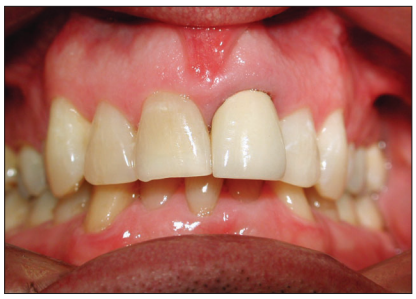

***Figure 1:*** *The left central incisor has a root fracture and requires extraction and immediate implant placement.*

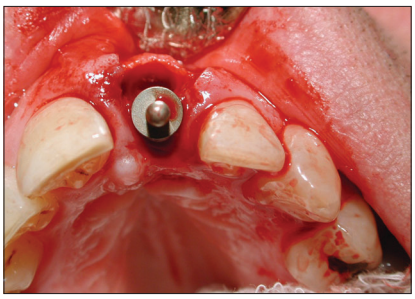

***Figure 2:*** *The tooth is extracted, leaving a large extraction socket and buccal bony contour. A pilot drill is used for correct angulation and depth.*

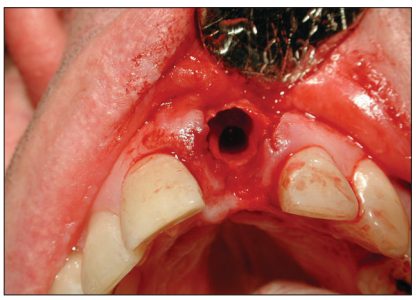

***Figure 3:*** *The osteotomy is completed. To achieve the correct angulations for an immediate implant, the osteotomy must be directed palatally and should not follow exactly the extraction socket, otherwise the restoration will be too far buccally.*

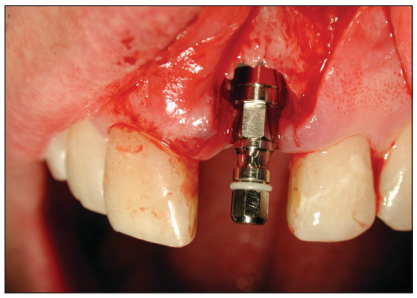

***Figure 4:*** *A nonsubmerged, immediate implant is used (Straumann TE, Waldenburg, Switzerland). The metal collar is above the bone and the abutment connection will be well above the alveolar crest. The implant is not sunk deep to hide the metal collar.*

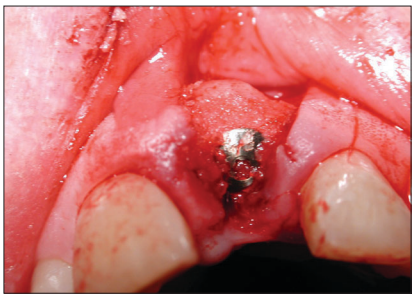

***Figure 5:*** *Rather than sinking the implant deeper to hide the metal collar, the area is grafted with autogenous bone.*

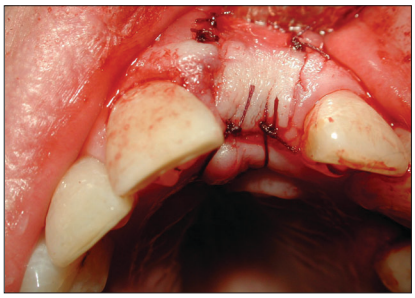

***Figure 6:*** *The soft tissue is augmented with a pedicled buccal flap, rolling the tissue on itself ("buccal roll") to increase the zone of keratinized tissue and to provide thick attached mucosa that will create an ideal scalloped gingival contour in the second-stage surgery.*

zone of connective tissue was removed — resulting in a biological width of only 2 mm after 6 months— bone resorption took place, with biological width reestablished to 3 mm at the expense of the bone around the implant.[4]

Understanding biological width will result in a more predictable long-term esthetic implant. Although a deeper implant is easier to restore with respect to its emergence profile, there is a price to pay later on. Hard and soft tissues will migrate apically. Therefore, in a zone of minimum soft tissue, rather than sink the implant deeper and risk further tissue loss, the soft tissue should be augmented while maintaining the implant head above the bone (0.5 mm above the alveolar crest).[5] Nonsubmerged implants have been shown to comply with the concept of biological width. Weber and others have demonstrated that the epithelial attachment is always more apical and located below the microgap in submerged implants, compared to nonsubmerged implants.[6] To obtain predictable, long-term esthetic soft-tissue outcomes, one may consider soft-tissue augmentation and nonsubmerged implants (**Figs. 1** to **6**). In cases where the tissue in the anterior zone is thin, don't fall into the trap and decide to deeply submerge the implant, instead of choosing to augment the soft tissue, thinking there will be less chance of metal showing. Once the tissue settles, you will be left with a longer clinical crown and poor esthetics. ➧

***Dr. Hassan Moghadam*** *maintains a private practice in Ottawa, Ontario. He is a member of Health Canada's Cells, Tissues, Organs and Assisted Reproduction Surveillance Group. He has no declared financial interests in any company manufacturing the products mentioned in this article. E-mail: hmoghadam@rogers.com.*

*Dr. Moghadam's presentation "Soft Tissue Management Around Dental Implants" is part of a session offered by the Ontario Society of Oral and Maxillofacial Surgeons titled* Refinements in Implant Dentistry. *The session will be offered on Thursday, May 6.*

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