

Unintentional Replantation: A Technique to Avoid

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The articles for this month's "Clinical Showcase" section were written by speakers at the 2006 CDA Annual Convention, which will be held August 24–26 in St. John's, Newfoundland. Dr. Roda's full-day session at the convention, titled "Endodontic diagnosis and therapy update," will be presented on Friday, August 25.

Many times in a dentist's career, he or she will make a decision that has unintended consequences. In the case reported here, some quick thinking was required to resolve the outcome of an unexpected series of events. Because clinical learning is best achieved by retrospective analysis, a list of lessons to be learned from this case is also provided, in the hope that it helps readers to avoid this particular situation.

Case Report

A 63-year-old woman presented with severe pain and extraoral facial swelling in the upper left quadrant, which had begun the day before the visit and was worsening. Her medical history was noncontributory except for mitral valve prolapse (with regurgitation); she was receiving antibiotic prophylaxis for subacute bacterial endocarditis. Her general dentist had attempted endodontic therapy that day on the upper left second premolar, but could not find the canals because of pulp calcification and difficulty achieving complete anesthesia; the patient had therefore been referred for specialist treatment.

Clinical examination revealed extensive extraoral and intraoral swelling extending from the upper left lateral incisor to the upper left second premolar;

the greatest contour of the alveolar swelling was over the upper left cuspid. Both teeth had been prepared as bridge abutments, but the temporary bridge was not present. There was an open endodontic access in the premolar with no pulp exposure and a small composite resin restoration in the cuspid. Both the cuspid and the second premolar were tender to percussion. The cuspid was also very tender to bite (determined with a Tooth Slooth instrument, Professional Results Inc, Laguna Niguel, Calif.) and to buccal alveolar palpation. The premolar was not tender to bite or palpation. The cuspid did not respond to cold tests, whereas the premolar was hyperresponsive but with nonlingering pain consistent with reversible pulpitis. Intraoral radiography (**Fig. 1**) showed the presence of a periapical radiolucency around the root end of the cuspid. There was thickening of the periodontal ligament space all around the root of the premolar consistent with occlusal trauma. There was also distal vertical bone loss associated with a 5 mm probing depth on this tooth. It was determined that the pain originated from the cuspid, and the final diagnosis for that tooth was pulp necrosis with acute apical (phoenix) abscess. The patient selected



Figure 1: A periapical radiolucency is visible at the root end of the cuspid.



Figure 2: Final obturation of the cuspid.

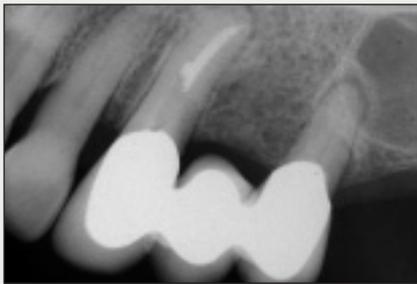


Figure 3: Radiography 1 year after initial treatment shows thickening of the periodontal ligament space on the premolar and complete healing of the cuspid.



Figure 4: Morell crown remover.

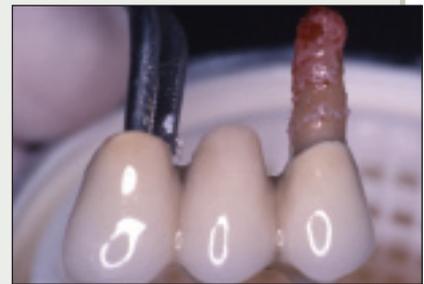


Figure 5: The premolar was inadvertently removed with the bridge. (Reprinted from Cohen and Hargreaves,³ with permission from Elsevier.)



Figure 6: Hank's balanced salt solution was used to bathe the premolar.



Figure 7: Mineral trioxide aggregate used to fill retropreparation.



Figure 8: Placement of mineral trioxide aggregate in the retropreparation.

nonsurgical root canal therapy (NSRCT) from the list of options provided.

The premolar access was filled with intermediate restorative material (Caulk Dentsply, York, Penn.), and the patient was warned to watch for symptoms of pulpitis that could necessitate root canal therapy in the future. An access preparation made in the cuspid tooth produced copious purulent exudate. A cotton pellet was placed in the access preparation to allow the tooth to remain open for drainage, since the exudate did not stop despite thorough debridement. Two days later, the cuspid was cleaned, shaped and closed. The treatment was finished uneventfully 2 weeks later, and the patient was referred back to her general dentist for post and core fabrication and placement of a fixed partial denture (Fig. 2).

The patient returned 1 year later with an intermittent spontaneous ache in the upper left quadrant which had started 10 days before. She had sensitivity to bite on the new bridge but no sensitivity to temperature. The bridge retainer on the cuspid was loose, whereas that on the premolar adhered well. Periapical radiography (Fig. 3) showed thickening of the periodontal ligament

space on the premolar with associated condensing osteitis. The apical lesion around the cuspid had completely healed, but the post space in the cuspid was empty. Clinical testing confirmed pulp necrosis with subacute periradicular periodontitis in the premolar. After discussion of the options, the patient chose NSRCT. The general dentist was informed of the situation. He asked if there was any way to remove the bridge intact to allow its reuse; he was informed that it was unlikely but could be attempted. The patient agreed, despite the risk of exarticulation of the premolar. A careful attempt to remove the bridge with a Morell crown remover (Henry Schein, Port Washington, N.Y.) (Fig. 4) resulted in inadvertent removal of the premolar with the prosthesis attached (Fig. 5).

The tooth was immediately replaced in the socket to allow time to procure the armamentaria needed for replantation. The tooth was gently exarticulated again and bathed in Hank's balanced salt solution (EMT Tothsaver, SmartPractice, Phoenix, Ariz.) (Fig. 6). A 0.5-mm section of the root end was resected, and the canal was instrumented from the apical dimension using rotary ProFiles (Dentsply Endodontics, Tulsa, Okla.), with



Figure 9: The cuspid retainer was resealed simultaneously with final replantation of the attached premolar.

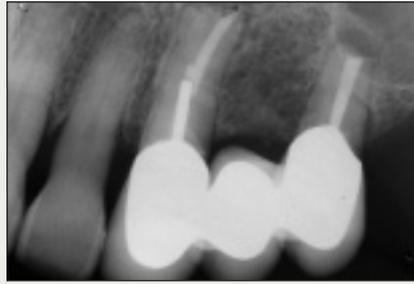


Figure 10: Radiograph taken immediately after cementation shows the preformed post in the cuspid and the final obturation of the premolar.



Figure 11: Complete healing 30 months after the premolar was replanted.

the salt solution as the irrigant. The canal was obturated with gutta-percha and an epoxy resin sealer (ThermaSeal Plus, Dentsply Endodontics). A small retro-preparation was made using a high-speed handpiece cooled with sterile water; the retro-preparation was filled with mineral trioxide aggregate (ProRoot MTA, Dentsply Endodontics) (Figs. 7 and 8). After disinfection of the cuspid post space, a #4 Parapost (Coltene/Whaledent, Cuyahoga Falls, Ohio) was cemented with glass ionomer cement (Fuji-Cem, GC America, Alsip, Ill.). The cuspid retainer was filled with Durelon (3M ESPE, St. Paul, Minn.) and resealed simultaneously with final replantation of the attached premolar (Figs. 9 and 10). Total time out of the socket was 35 minutes; the tooth was continuously bathed in the salt solution during that period. The patient had minimal soreness over the next few days, which resolved completely. Re-evaluation at 30 months (Fig. 11) showed complete healing around both asymptomatic abutments, and the prosthesis was clinically intact.

Lessons Learned

This case illustrates some pitfalls in clinical decision-making that need to be avoided. The following guidelines represent lessons learned from this case.

Do not attempt to perform endodontic therapy on a tooth (in this case, the second premolar at the time of the initial swelling) unless you are certain of the diagnosis.¹ If you cannot accurately determine the cause of a patient's problem, you must refer the patient to someone who can. At the very least, you should not perform any treatment if there is any uncertainty about the diagnosis.

If an endodontic access has been attempted on a tooth, especially one that is to be used as a bridge abutment, perform the endodontic therapy, even if there is no exposure of pulp and the pulpitis appears to

be reversible. In this situation, there is a high likelihood that pulpal pathosis will develop.

If there is a post space in a tooth, fill it with a post, with gutta-percha and sealer, or with some other restorative material. In the case reported here, the presence of a post and core might have prevented the cuspid retainer from being dislodged.²

Do not attempt to remove a bridge intact unless both abutments are sound and firmly attached to the periodontium. Even under ideal circumstances, this procedure frequently results in damage to the prosthesis or teeth, and it is often impossible to remove the prosthesis in any case.³ Despite the great success of intentional replantation in endodontics,⁴ unintentional replantation cannot be recommended, because of its uncontrolled nature.

Never perform any treatment simply because a patient or another practitioner requests it. If you have any reservations about a course of action, find an acceptable alternative. Otherwise, your practice may become more "exciting" than you would like. ✦

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Diagnosing Denture Pain: Principles and Practice

Robert W. Loney, DMD, MS



Dr. Loney's full-day session at the CDA Annual Convention, titled "Making removable prostheses work," will be presented on Saturday, August 26. For more information on the 2006 CDA Annual Convention, to be held August 24–26 in St. John's, Newfoundland, visit the CDA website at www.cda-adc.ca.

Clinicians can use 5 strategies to save time and minimize repeat visits for patients who have problems with their complete or removable partial dentures: 1) establish the differential diagnosis, 2) identify variations from normal, 3) have the patient demonstrate the problem, 4) always use an indicating medium when making adjustments to prostheses and 5) have the patient rate perceived improvement after adjustments.

Establish the Differential Diagnosis

To eliminate a denture problem, its cause must first be correctly identified. Take a good history and perform a thorough clinical examination. Establish a list of potential causes (the differential diagnosis), rank them according to frequency, and begin by eliminating those most likely to be causing the problem in the particular patient. If the cause of the problem is correctly identified and addressed, the pain, ulceration and other related signs and symptoms should resolve in 10 to 14 days.¹ Biopsy is mandatory for any lesion that fails to heal within 14 days after onset,² particularly when a denture has

been ruled out as the source of the ulcer. Work down the list of possible diagnoses until the problem is solved.²

Diagnosing the problem requires a thorough history from the patient, including the following specific information:

- When did the pain start?
- How long does it last?
- What makes it better?
- What makes it worse?

Combined with information from the clinical examination, this information will help to establish the differential diagnosis, and the clinician can rank the most likely causes at the top of the list. The clinical examination should incorporate the strategies of identifying variations from normal, having denture patients demonstrate their problems and using an indicating medium.

Identify Variations from Normal

Many denture problems can be identified by inspecting the dentures critically for variations from normal (Figs. 1 to 7). Unusual extensions, contours, tooth positions, thickness and finish can all be sources of denture problems. Intraoral

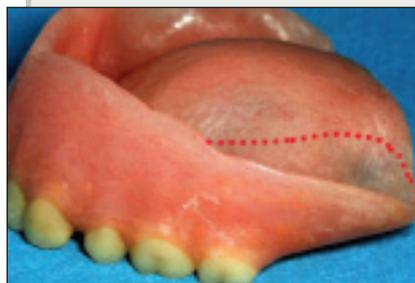


Figure 1: The posterior buccal flange of this denture is shorter than normal and should be extended to the dotted line. Compound or light-cured acrylic resin could be added to the periphery in an attempt to extend the border. When this approach was taken in this case, the patient's denture became markedly more retentive.



Figure 2: The transparent areas of resin over the tuberosities provide a clue that the lower denture is contacting the upper denture, thereby causing wear to the base. Such contact can cause the denture to loosen.



Figure 3: Severe and uneven wear on these dentures is responsible for esthetic problems, discomfort and difficulty chewing.



Figure 4: The distolingual flange of this mandibular denture looks different from a typical flange. Normally, the flange contour will either proceed straight down or arc gently downward and forward from the pear-shaped pad, but this one extends too far posteriorly from the position of the retromolar pad. This overextension caused pain on swallowing.



Figure 5: This patient had multiple sore spots associated with the denture, and previous adjustments to the denture bases had not provided any relief. The denture midlines are off, and the denture teeth in the second and third quadrants are meeting cusp to cusp, which suggests that poor occlusion could be the cause of the patient's problems.



Figure 6: Posterior interferences between the denture bases can cause tipping of the dentures, which results in pain similar to that caused by occlusal problems.



Figure 7: It is usually better to place and load posterior denture teeth centrally (C) over the ridge.³ More tipping problems result when occlusal forces are applied buccal to the ridge (B).⁴ These tipping problems can cause both looseness and pain.



Figure 8: This patient had 3 unsuccessful maxillary partial dentures made within 1 year. Each time, she had requested only a new "upper plate and nothing else." However, all 3 dentures had failed because of fracture of the denture teeth and severe mobility of the prosthesis. The real problem was a lack of interarch space for the prosthesis, which the care providers had failed to identify because, in taking direction from the patient, they were looking only at the maxillary arch. The lesson from this case is that the clinical examination must be thorough, to ensure that all potential problems and variations from normal are identified.

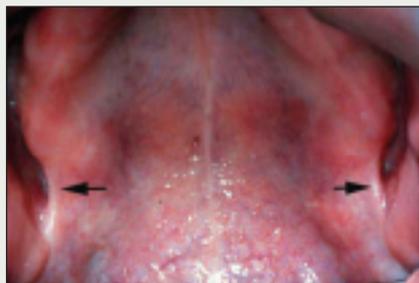


Figure 9: This patient has very tight pterygo-mandibular raphes (arrows). As the raphes tighten during opening, they pull on the posterior border of the denture, causing it to loosen (the patient's chief concern). Relief for these structures should be provided during the making of the impressions. This case emphasizes that anatomic variations must be identified to minimize denture problems.

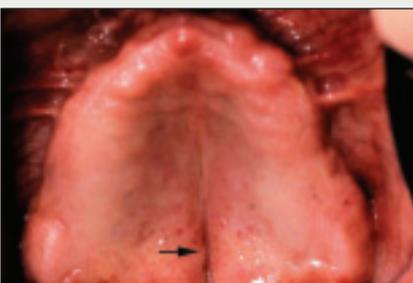


Figure 10: In this patient, the deep midline soft-tissue fissure at the posterior of the palate caused a break in the seal of the denture, which in turn caused looseness and dropping of the denture. Special attention is needed to ensure that the posterior palatal seal of the denture maintains tissue contact to provide adequate retention.



Figure 11: Ulcers, sore spots or areas of hyperkeratosis on the sides of the ridges, which are not identified by pressure indication medium, are typically caused by tipping of the denture. Tipping is frequently associated with occlusal problems.

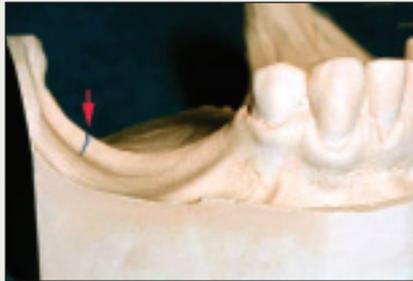


Figure 12: Posterior teeth set over the ascending portion of the ramus can cause a denture to slide or shift during function,⁵ causing occlusion-related pain. Therefore, do not set denture teeth posterior to the position indicated by the arrow.



Figure 13: When a single denture opposes the natural dentition, the occlusal plane should not have a severe curve of Spee. Such a curve will place tilting forces on the denture in excursive movements, which frequently causes both looseness and discomfort.

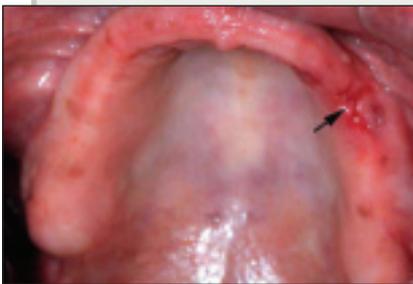


Figure 14: Areas of inflammation or ulceration that are caused by the denture base are often discrete and cannot be distinguished from similar areas related to occlusal problems. The diagnosis must be established through the history, a clinical examination and indicating medium. The definitive diagnosis is often determined by exclusion of other possible causes.



Figure 15: This patient is using a small piece of cotton roll to demonstrate where the maxillary denture loosens when he is chewing. Having patients demonstrate their problems while the dentist watches can often expedite the diagnosis of denture problems.

inspection for anatomic or tissue abnormalities or variants may also give clues to the cause of some denture problems (Figs. 8 to 14). If an abnormality is found and corrected, the signs and symptoms should resolve within 10 to 14 days.

Have the Patient Demonstrate the Problem

Asking the patient to demonstrate how the problem occurs often helps the clinician to identify its source. If the problem occurs only when the patient chews, cut a small piece of a cotton roll, dampen it, and let the patient demonstrate the location where the bolus causes the symptom (Fig. 15). If the problem occurs during speaking, singing, drinking or opening wide, have the patient replicate the circumstances. Have the patient describe what

they experience, and watch carefully to determine the cause of the problem. Attempt to eliminate the cause and recall the patient in 10–14 days to ensure that the signs and symptoms have resolved.

Use an Indicating Medium when Making Adjustments

Clinicians usually check occlusion of restorations using an indicator such as articulating paper or shim stock. Similarly, denture adjustments are more accurate and effective when an indicating medium is used. Pressure- or fit-checking medium, indelible markers and articulating paper can all be used to aid in locating a problem and determining the degree of adjustment that is required (Figs. 16 to 20).



Figure 16: Pressure-indicating medium is necessary to identify denture base impingements. Apply the medium with a stiff bristle brush, coating the denture with enough paste so that the base is mostly the colour of the medium. Leave streaks in the paste. Place the denture intraorally, avoiding contact with cheeks and lips. Press firmly into place over the first molars. Do not tip, tilt or wiggle. Remove and inspect the denture. Areas with paste and no brush strokes represent areas of moderate tissue contact (C). Areas without paste (burn-through) represent areas of tissue impingement (I). Areas with streaks remaining in the paste have not contacted the tissue (N).



Figure 17: A well-adjusted denture base. Areas of tissue inflammation that do not correlate to areas of burn-through are most likely caused by tilting of the denture. Potential occlusal causes should be investigated.



Figure 18: Lines of burn-through on flanges often indicate areas that are overextended or too thick. They may require repeated adjustments and applications of paste.

Box 1 Typical histories for patients with denture pain

For pain related to occlusion

- Hurts only when chewing
- Gets worse with chewing
- Gets worse as the day progresses
- Patient may have to remove prosthesis late in the day because of discomfort

For pain related to denture base fit

- Problem starts when the patient inserts the denture, which often feels tight or causes soreness
- Patient has discomfort even when not chewing
- May or may not get worse as the day progresses

For pain related to occlusal vertical dimension (OVD)^{5,6}

Insufficient OVD (Fig. 21)

- Lack of chewing power
- Minimal ridge discomfort
- Angular cheilitis
- Chin prominent
- Minimal display of vermilion border

Excessive OVD (Fig. 21)

- Soreness over entire ridge
- Worse during the day (increased occlusal contact)
- Dentures “click” when speaking
- Mouth feels “too full,” patient has difficulty getting lips together



Figure 19: Pressure-indicating medium can be used on non-bearing surfaces of the denture to identify other undesirable contours. This photo demonstrates an impingement of the coronoid process on the posterior denture flange during lateral excursion. This interference caused both pain and loosening of the denture.

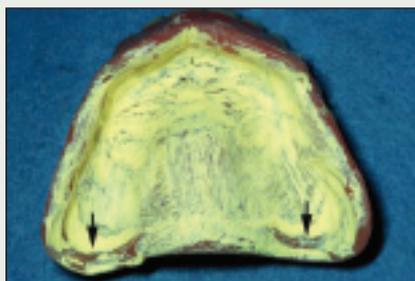


Figure 20: A sharp, thin or overextended periphery in the hamular notch area can cause painful ulcers. Use of indicating medium is critical for adjustment of these areas, because removal of acrylic in the wrong area can result in a breach of the posterior palatal seal, which will result in loosening of the denture and little relief of the discomfort.



Figure 21: Examples of insufficient (left) and excessive (right) occlusal dimension. Although adjustments are sometimes helpful, a remake of the denture is usually required to completely resolve these serious denture problems.

Have the Patient Rate Perceived Improvement after Adjustments

If a clinician asks the patient whether a denture adjustment has made the situation better, the most likely response is “yes.” But if the adjustment has improved the situation by only 20%, the patient is likely to return with the same problem at a subsequent appointment. A better question is “How does that feel?” If the patient states that it feels “better,” he or she should be asked to rate how much better, in terms of a percentage. An ulceration may not feel 100% better at the end of an appointment, but the improvement should feel closer to 90% than to 20%.

Causes of Denture Pain

Possible causes of denture pain include occlusion, denture base (fit and contour), vertical dimension, infection, a systemic disease or condition, or an allergy (rare).

It is probable, although unproven, that occlusion and poor fit of the denture base cause more repeat visits for denture-related pain than the other causes listed. The latter 3 causes (infection, disease and allergy) should never be overlooked, especially when ulcers or pain are persistent despite interventions, but for the purposes of this paper, only the first 3 causes are addressed (Box 1).

Conclusion

Many clinicians deal with denture-related pain by grinding the denture base in the area of the

reported pain. This type of blanket solution is akin to a physician prescribing a broad-spectrum antibiotic to all patients who have a sore throat and runny nose. It assumes, incorrectly, that the denture base is the source of all denture pain. Clinicians can save time and minimize repeat visits for patients with denture problems when they use a systematic approach to correctly diagnose denture pain. ➤

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