

MAXILLARY MOLAR SURGERY: A BUCCAL APPROACH TO THE PALATAL ROOT

A review of 96 clinical cases

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While retreatment of endodontic therapy has received much attention in recent literature, and new instrument technology and improved optics have made way for greater success in retreating canals, there are still clinical

situations that require another approach. It is not always possible for a patient to have his tooth disassembled, then re-assembled, not to mention the stress on the tooth structure itself of crown, core and post removal. When a clinician spends several hours over

Figures 1a-f. Variations in palatal root canal anatomy.

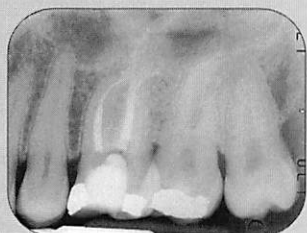


Figure 1a. Dilaceration



Figure 1b. Apical curvature

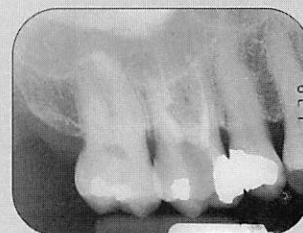


Figure 1c. Accessory canal



Figure 1d. Apical bifurcation

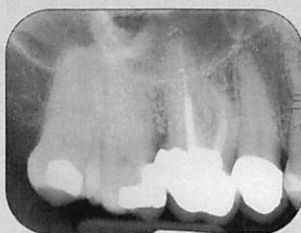


Figure 1e. Apical bifurcation



Figure 1f. Apical trifurcation

All cases were obturated by thermo-plastic injection of gutta percha.

Figures 2a-g



Figure 2a

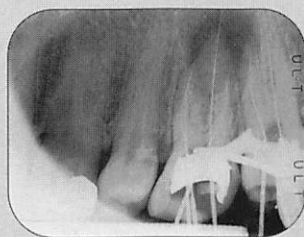


Figure 2b



Figure 2c

Figures 2a, 2b, 2c. Large lesion at palatal root apex. Incomplete obturation of canals on 2.6. Tooth 2.7 involved from the M.B. root apex. Instrumentation for retreatment of 2.6, conventional treatment of 2.7. Post-op after obturation and retrograde surgery, all completed at same appointment. Biopsy of lesion at palatal root reported "radicular cyst in acute exacerbation."



Figure 2d

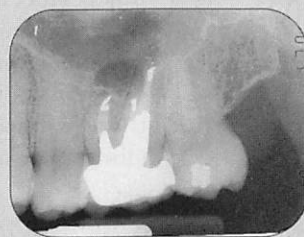


Figure 2e

Figures 2d, 2e. Overfill of all roots, post-core crown assembly in place. Surgical retroseal of all roots.



Figure 2f



Figure 2g

Figures 2f, 2g. Previous surgery with incorrect retrograde filling placement. Re-surgerization, incorporating all roots.



Figure 3a



Figure 3b

Figures 3a-b. Sub-membrane approach. Sinus floor contacted, but membrane intact. Eight-month recall.

are thoroughly cleaned and densely obturated, and an anatomic irregularity occurs in the apical few millimetres, the avenue of root-end surgery becomes clear (Figure 1). Studies have shown variations in the canal system of the palatal root, with the main canal exiting to a lateral surface 88.5 per cent of the time.¹

The roots of maxillary first molars (and many second molars) are often found in close approximation to the floor of the maxillary sinus or antrum. The divergence of the roots of these teeth sometimes allows the sinus cavity to extend downward toward the furcation. The consideration of this anatomic variation can often impact on the attempt, approach and successful completion of apical surgery on all roots.

While basic dental school training teaches to avoid the maxillary sinus as much as possible, many oral surgeons prefer the buccal approach to resecting the palatal root. This may require entering and performing root-end procedures through, under or at the floor of the maxillary antrum. The following is a discussion of this surgical approach and a review of 96 clinical cases.

PREOPERATIVE ASSESSMENT

When the factors of the patient's health, the periodontal status, the obturation of the canals (conventionally) and extent of prosthetic restoration of the particular molar in question have been assessed, and

several appointments to treat the root canal system, it may be difficult for a patient to accept that it has to be done all over again. That is not to

say that inadequately cleaned canals can be surgerized successfully - the basic endodontic principles must be adhered to. But when root canals



Figure 4a

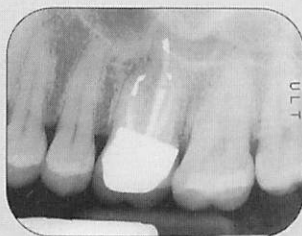


Figure 4b

Figures 4a-b. Trans-sinus approach. Sinus cavity entered after bevel of buccal roots.

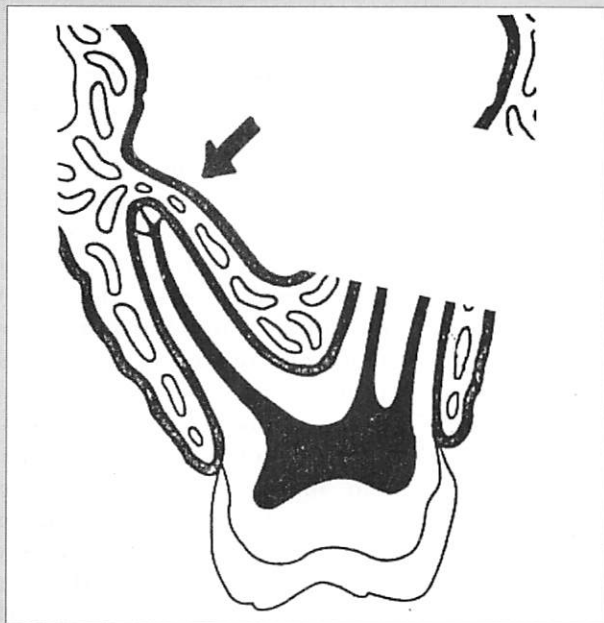


Figure 5. Viewing the floor of the maxillary sinus over the palatal root. Under the membrane, the root prominence can be seen as a "rise" in the floor.

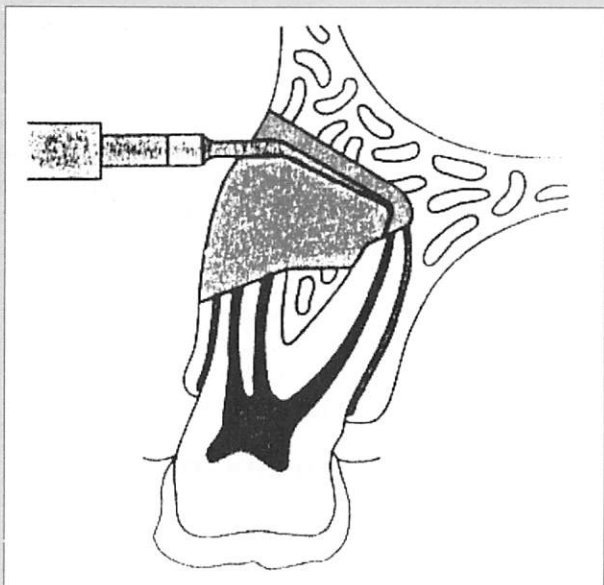


Figure 6. Ultrasonic root-end preparation has allowed better access to all roots, with deeper placement of filling along true canal path.

the decision has been made to surgerize this tooth, the clinician should determine if the palatal root is part of the problem (apical lesion), if it can be reached, and then if it should be included in the root-end procedures (Figure 2).

Preoperative clinical and radiographic evaluation can be helpful in determining the depth of the palatal root from the buccal cortical plate, and the degree of divergence between buccal and palatal roots.

Two, and even three periapical films — parallel, mesial-angled, and distal-angled — can display, by the buccal object rule, the amount of "displacement" of the palatal root by comparison of films. It has been suggested that a parallel, mesial-angled, and more-mesial-angled series of films should be employed.² In many cases, where there is an edentulous span mesial to the molar, the clinician can utilize a mesial-buccal approach for root access.

Utilizing periapical radiographs to assess the floor of the maxillary sinus can be misleading. Unless all roots are well beneath the sinus floor, with three to four millimetres of maxillary bone to spare, then it should be assumed that the sinus will be encountered during the surgical procedure. More discussion of this will follow in the approach to the roots.

Clinically, by placing the forefinger on the buccal plate, and the thumb on the palatal plate of bone at the level of the apices, an estimate of divergence (thickness between the cortical plates) can be made. Generally, a high palatal vault correlates to more vertical and less divergent roots. Likewise, a shallow, broadened palatal vault may indicate a wide divergence between buccal and palatal roots. If a flat palatal vault exists, and the clinical situation reveals a fistula on the palate tracing to the palatal root, then a conventional palatal flap approach may be more prudent as the pathology has already displayed the location of that root.

THE "APPROACH"

All basic endodontic surgical principles apply, but a few modifications can be made to allow easier access to the deeper palatal root. First, full sulcular flap design can be altered to have a releasing vertical incision two teeth mesial to the operative tooth, or to have an exaggerated diagonal releasing incision one tooth mesial — both will allow for easier retraction and less muscle pull. Second, the identification of the buccal root apices by cutting of bone should be started more superior, to assess the full length of the roots, and to leave as much crestal bone intact as possible over the buccal roots. The bony access or window over the mesio-buccal and disto-buccal should be one confluent opening, as all procedures for the palatal root preparation and retroseal will be completed through this opening.

Figures 7a-l. Four cases of maxillary molar surgery. Pre-op film, immediate post-op film, and first recall at three to six months.

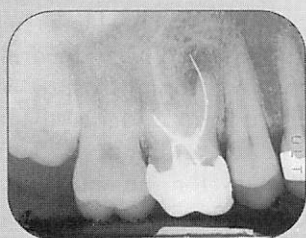


Figure 7a



Figure 7b



Figure 7c



Figure 7d

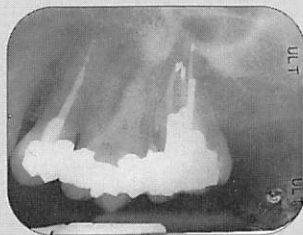


Figure 7e

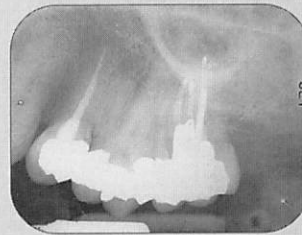


Figure 7f

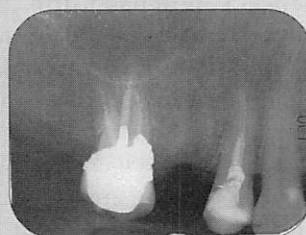


Figure 7g

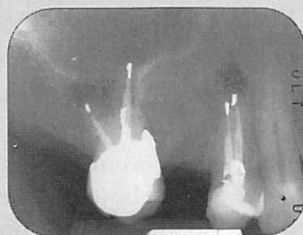


Figure 7h

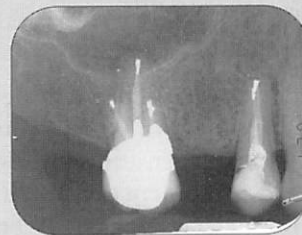


Figure 7i



Figure 7j



Figure 7k



Figure 7l

The terms "trans-antral" and "trans-sinus" have been labelled to this approach, but it can really be subdivided into three categories:

i. Sub-sinus approach: All roots of the molar are inferior to the floor of the maxillary sinus. Even after bone crypts are prepared, and roots are bevelled, there is no communication with the sinus. In effect, this becomes just a very deep root-end preparation.

ii. Sub-membrane approach: All roots of the molar are inferior to the bony floor of the maxillary sinus, but the Schneiderian membrane (sinus cavity lining) is revealed and not violated in crossing from the buccal root to the

palatal root. If the lining can be kept intact, it will help to control and stop sinus fluid from entering the bony crypt of the palatal root preparation (Figure 3).

iii. Trans-sinus approach: As the buccal roots are bevelled, the sinus membrane is immediately and unintentionally cut, revealing the large space of the maxillary sinus (Figure 4).

The third category is the most technically challenging. Once the sinus cavity is entered, the question of what to do next arises. If the buccal window of the entry is of sufficient size, and magnification, lighting and surgical suction are optimum, the sinus membrane can be slightly lifted off the floor so that the root prominence

Figures 8a-d

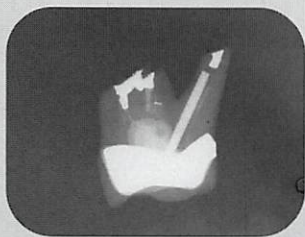


Figure 8a

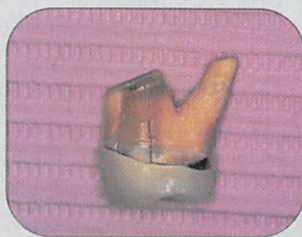


Figure 8b



Figure 8c

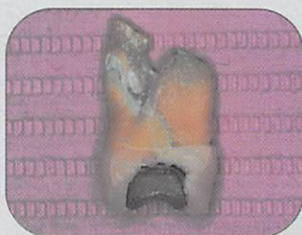


Figure 8d

Figures 8a, c. Radiographs of surgical failures, proximal view.
Figures 8b-d. Vertical root cracks, not detected at time of apical surgery.

of the palatal root can be identified as a rise in the bony floor of the sinus in that location (Figure 5). With an endodontic explorer, the sinus floor can be probed to identify this prominence. If there is pathology associated with the palatal apex, it will be readily identified by the explorer. As with any buccal root prominence, the superior extent of this "rise" will usually identify the apical portion of the root. The bevel procedure can start at that location.

All root-end procedures would follow as in any other root. Of the 96 cases reviewed over a five-year period, approximately half were carried out before ultrasonic retropreparation was utilized. Incorporating ultrasonics has made access and root-end preparation easier (Figure 6). Fluid control in the bony crypt can be handled in different ways. An E.N.T. iodoform gauze, that packs almost the entire sinus cavity, could be used. A 2" by 2" gauze square soaked in lidocaine 1/50 epinephrine could be custom cut and fit with a tail brought out to the buccal and held under the retractor (for retrieval). In most of the 96 cases reviewed here, no packing was utilized - just optimum surgical suction and careful material placement. As with most surgical procedures, the more often the procedure is carried out, the more comfortable the operator feels in the sinus cavity, thus the more efficient the surgery becomes.

CLOSURE

After retrofilling, all extraneous material is removed, any packing is retrieved, and a radiographic check is taken. The flap is then re-approximated and sutured closed.

When the sinus membrane and sinus cavity are

exposed or perforated in the course of identifying and handling the palatal root, this does not appear to create post-surgical problems because the defect is sealed from the oral environment by proper closure of the flap. There is no evidence to suggest the need for antibiotic or antihistamine therapy for the sinus exposure itself (antibiotics may be prescribed for periapical pathology) as the tooth is not being extracted and therefore no oral-antral fistula is created.³

POSTOPERATIVE EVENTS

All aspects of the endodontic surgery are explained to the patient preoperatively. Special attention to the maxillary sinus is included to prepare the patient for what can be expected. During the procedure, in an open exposure of the sinus, the patient may experience a "post-nasal drip" sensation, where fluid and water spray may drain from the sinus, through the

nose, and down the back of the throat. If this happens, and the patient is prepared, there is no panic, and the event may or may not be acknowledged afterwards. However, latent drainage may become apparent in the form of a nosebleed. This was noted in two out of 96 cases reviewed. This occurred in the form of some small amounts of dried blood on the pillow the next morning. Again, the patients were advised, prepared, and this proved to be a minor concern.

All other post-surgical events were explained and occurred within the normal range from a standpoint of swelling and discomfort. In three notable cases, the patients reported an immediate clearing of a chronically congested sinus on the operative side, and a sensation of deeper breathing and improved sense of smell.

SUCCESS...AND FAILURE

In reviewing the literature, success with periapical surgery has been reported to range from 25 per cent to 90 per cent encompassing many parameters, from the tooth, the materials, the patient pool and the operator pool. As stated by Seltzer, "The use of the term adequate clinical function is more realistic and satisfies the need of the clinician, in as much as the retention of the tooth in function is the ultimate goal of endodontic therapy."⁴

Of the 96 cases reviewed, 85 teeth are still present and in function, giving an evaluation of 88.5 per cent for this small data pool with limited time frame. Some specific recall films are shown to illustrate apical bone growth over all roots (Figure 7).

The failures that could be retrieved were interesting

from the standpoint of what was found at the time of extraction. The oral surgeons involved were asked to report back on the condition of the tooth and the socket. Even in cases where the operative tooth came out in many fragments, the sinus membrane was reported to have regenerated. Two clinical specimens are shown, illustrating vertical root cracks not detected at the time of surgery (Figure 8).

DISCUSSION

With recent clinical advancement in materials, ultrasonic instrumentation, magnification and illumination, endodontic root end surgery can encompass previously unattainable locations of roots, and unseen canal anatomy (such as the second mesio-buccal canal with the adjoining isthmus).

Surgery is not a panacea for failing endodontics due to missed canals, or poorly cleaned and obturated canals. Assessment for retreatment is still primary to surgical consideration, even if elaborate prosthetics must be removed. However, in situations where the conventional endodontics meets or surpasses the standard of care, and complex prosthetics is in place, surgical treatment of all roots of the concerned tooth can be incorporated.

As surgical endodontics moves towards routine use of the operating microscope, attaining these goals should become easier. ♦

ACKNOWLEDGMENTS

Diagrams from: Cohen and Burns, *Pathways of The Pulp*. Sixth Edition St. Louis: Mosby - Year Book Inc., 1994. Reproduced with permission of: Dr. Gary Carr, Pacific Endodontic Research Foundation.

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Dr. Cohen is a clinical endodontist who practises in Mississauga and Oakville. He has a special interest in applications of the operating microscope in endodontic therapy. He obtained his specialty in endodontics at Temple University, Philadelphia in 1988.

Editor's Note: This article was reprinted from the December, 1995 issue of Ontario Dentist due to the poor reproduction of radiographs. We apologize to Dr. Cohen for this incident.