There are several treatment options for managing teeth that have become symptomatic or have unresolved periradicular radiolucencies after initial root canal treatment. The two most common procedures include endodontic retreatment and apicoectomy surgery. While the latter treatment’s main benefit is that it reduces risk to the coronal restoration, it does not eliminate the etiology of symptoms.

An apicoectomy essentially seals in, or contains, infection within the root canal system. This allows for the future risk of recontamination to the periradicular tissues. Intracanal infection may leak through accessory canal spaces or even the apical retrofill and into the periradicular tissues. Through orthograde endodontic retreatment, infection within the root canal system may be eliminated and therefore ultimately allow the greatest long term success for the healing of the surrounding tissues.

Advances in the field of endodontics have had a tremendous impact on success rates. With the use of the surgical operating microscope (SOM), rotary NiTi files, and ultrasonic instruments, endodontic retreatment has become a predictable and minimally invasive treatment. Smaller access preparations allow for minimal trauma to coronal restorations. It is unlikely that a full coverage restoration would be sacrificed during this treatment. A crown may come loose when significant recurrent decay is present, which is a major source of contamination to the root system. In this situation, restoration replacement would ultimately result in a much greater long term success.

In addition to eliminating infection from within the root canal system, another key advantage of endodontic retreatment is that it maintains root length and therefore does not weaken the periodontal support of the tooth. Due to the nature of an apicoectomy, specifically its need to address the apical delta, this procedure must result in a shorter root length. This will irreversibly weaken the support of the tooth.

While apicoectomies have their place in endodontic treatment, orthograde retreatment should always be given careful consideration. Microscopic retreatment can more thoroughly address the most common etiologies of pathology associated with teeth having previous root canal therapy (outlined on the bottom left). The following cases demonstrate situations in which apicoectomy treatment would have fallen short of providing long term success. Only retreatment addressed the etiology.

**MISSED CANAL SPACES**

**CASE 1:** An 87 year old female was referred with a chief concern of extreme pressure sensitivity from her upper left teeth. Her symptoms had started 2 days earlier when she bit down on something hard and had been increasing since.

Despite the presence of a full upper fixed partial denture, symptoms were able to be localized to tooth #12 with percussion and palpation testing. The periapical radiograph revealed a suspicious oblique radiolucency in the midroot area, mimicking a possible root fracture.

Treatment options of endodontic retreatment, apicoectomy, and complete root removal were discussed. Endodontic retreatment revealed a previously untreated buccal canal. Upon a follow-up phone call that evening, the patient expressed that her symptoms had resolved. In this situation, the retreatment was diagnostic as well as therapeutic. A root fracture was ruled out and there was no unnecessary removal of bone or root structure.
**Case 2:** A 33 yo male presented with a buccal sinus tract associated with tooth #30 and probing depths >6mm along the buccal and lingual surfaces. Radiographic evaluation revealed an apical radiolucency at the distal aspect of the distal root.

Treatment options of retreatment, apicoectomy, and extraction were discussed. Due to the proximity of the radiolucency to the adjacent tooth #31 and the short root length of the distal root, it appeared that an apicoectomy may have risks that outweigh its benefits.

A previously untreated disto-lingual canal was observed with the surgical operating microscope and treated along with the other 3 canals. The apical bone displayed ideal healing at the 2 year follow-up visit.

**Case 3:** A 55 yo female was referred to our office after she had sought a second opinion for the treatment of tooth #18. She had initially been informed that extraction would be the only treatment option likely to achieve bone healing. Due to the extensive adjacent bone loss along the distal root, the patient was informed that the prognosis of endodontic treatment would be guarded.

Motivated to maintain this tooth, the patient elected to have the endodontic retreatment procedure. Upon access and post removal, a previously untreated disto-lingual canal orifice was observed. Endodontic retreatment also allowed for microscopic inspection of the internal canal walls of the distal root for cracks and fracture lines. The treatment was completed once the canals were cleaned and no fracture lines were observed. A 21 month follow-up revealed supreme bone fill.

**Case 4:** A 58 yo male was referred for root-end resection of the mesio-buccal root due to the presence of an apical radiolucency. When reviewing this case with the referring dentist, the delicate and conservative care of the crown was discussed and retreatment was agreed upon.

The photographs demonstrate the usual location of the MB2 orifice, just mesial to the line from the MB canal orifice to the palatal canal orifice. Careful troughing with a small round bur or ultrasonics under microscopic vision makes the location and negotiation of the MB2 canal highly predictable.

**Case 5:** A 75 yo female had persisting biting sensitivity 4 weeks after the root canal treatment of her tooth #15. Because this tooth was planned to be the posterior abutment for a full-arch FPD, the resolution of symptoms was critical prior to the final restorative work.

Although the quality of the previous endodontic treatment appeared to be sufficient, retreatment was performed. A previously untreated MB2 canal was addressed and symptoms were eliminated within 24 hours after treatment had been performed.

**Case 6:** A 52 yo female had been informed by her endodontist that an extraction was the only treatment option for tooth #14, due to an unresolved sinus tract and symptoms. Root canal treatment was done by the specialist several years earlier and an apicoectomy was performed within the last 2 months. She elected to try endodontic retreatment at our office before seeing the oral surgeon for the extraction. A previously untreated MB2 canal was discovered and was found to be within a completely separate root from the MB1 canal, not addressed with the surgery. The sinus tract that had been present for several months, despite the apicoectomy, resolved within 1 week after the retreatment.

**Case 7:** A 39 yo female presented with percussion and palpation symptoms from tooth #6. An apicoectomy procedure had been performed several years prior. Careful evaluation of the preoperative radiograph revealed a break in the lamina dura at the midroot level of this tooth and a widened PDL space at the apex. Another apicoectomy would result in the destruction of interproximal bone in order to gain access to the lateral radiolucency or the removal of significant root structure (from the apex to the lateral lesion) condemning the support of this tooth. With endodontic retreatment, both the apical portion of the root as well as the mid-root accessory canal were addressed. Because the infection had been eliminated from within the root canal system versus being contained, there should be no future opportunity for infection inside the canal spaces to reach the adjacent bone through other channels. Therefore the long term prognosis is now more favorable. Other cases of lateral canals causing bone loss are on the right.
ACCESSORY CANALS

Case 8: A 58 yo female was referred for apicoectomy procedures for teeth #4 and #5. In order for an apicoectomy to address the interproximal bone loss, the apical third of these roots would have had to be removed, resulting in considerable loss of root support and likely tooth mobility.

With conventional root-end resection of the apical 3mm of each root, bacteria would have remained within the lateral canal space of tooth #5, which apparently was the etiology of the bone loss leading to the sinus tract present (evidence by the gutta-percha tracer in the final radiograph). Allowing the etiology of the bone loss to remain within the root canal system would not only prevent healing, it would likely result in the future decision to redo the apicoectomy or consider extraction. The crowns of these teeth remained stable and intact during the retreatment procedure.

FINS/ISTHMUSES

Case 9: A 34 yo female had been experiencing tenderness from tooth #18, despite root canal treatment and retreatment over a 4 year period. Endodontic access with a SOM revealed extensive fins of necrotic tissue within a “c”-shaped anatomy root canal system. These fins and isthmuses were troughed with ultrasonic instruments until only “clean” dentin remained between the canal orifices. Along with visual elimination of this debris within the fins, chemo-mechanical cleaning was performed with alternating rinses of 6% NaOCl and EDTA (chelating agent) with coincidental acoustic streaming by ultrasonics. With the elimination of necrotic tissue and infection from the root canal system, symptoms resolved soon after and osseous healing was determined upon a 1 year follow-up evaluation. The most commonly observed locations of fins of tissue are between MB and MB2 canals of upper molars; MB and ML, and DB and DL canals of lower molars; B and P canals of upper premolars, and B and L canals of lower premolars and incisors.

The photograph on the left illustrates tissue remaining in a fin after initial therapy. The fin after tissue removal is demonstrated on the right.

CALCIFIED CANALS?

Case 10: MB and ML canals were treated after patient had been explained by previous specialist that the only treatment would be an apico.

A misconception in dentistry is that canals not radiographically visible can not harbor bacteria. There is no canal too calcified to treat with the proper equipment and expertise.

LEDGED CANALS

Case 13: A 55 yo female had percussion and biting sensitivity from tooth #3 since root canal treatment was performed 3 years earlier. The operator had recommended an apicoectomy should symptoms persist, but the patient was apprehensive and elected to wait.

An untreated MB2 canal helped facilitate the negotiation of the apical half of the MB root. Symptoms resolved soon after retreatment.

Case 14: An 88 yo female presented with a facial swelling associated with tooth #10. An apical ledge was apparent, lowering the predictability of achieving an ideal result. Retreatment was attempted, prior to an apicoectomy if needed, in order to preserve root length. The ledge was bypassed and therefore the apicoectomy was unnecessary. Osseous healing was evident upon a 2 year follow-up.
Case 15: A 50 yo female had been experiencing discomfort since the initial root canal treatment of tooth #31. She had been previously informed that her only treatment option was extraction should her symptoms fail to resolve. Two instrument fragments were removed from the mesial canals, allowing for treatment of the apical canal spaces and the resolution of symptoms. Converging canals are a common cause of instrument separation.

Case 17: Microscopic visualization of the instrument(s) allows for more predictable removal.

Case 18: A 55 yo female had developed an extraoral swelling from bone loss associated with tooth #26. The proper retrofill would not have been possible due to the proximity of the post to the root apex. The 2 year follow-up PA (mailed) shows ideal bone healing and long term success of the crown after retreatment with post removal.

Case 19: Retreatment with post removal allowed for maintaining the maximum root length for this critical abutment. The size of this post was a concern of previous clinicians.

Case 20: A root fracture was initially suspected due to the sudden onset and severity of symptoms from tooth #29. Retreatment was able to rule out a fracture and eliminate the infection.

Case 21: A 48 yo male presented with buccal gingival swelling associated with tooth #19. Because the buccal sulcus also had a probing depth >7mm, the patient was informed of the guarded prognosis for this tooth. The prognosis would have been hopeless if a root fracture had been observed upon microscopic examination during retreatment. A perforation was identified as the etiology of bone loss instead. The size and length of time the perforation had been present lowered the prognosis of the perforation repair. However, perforations below the crestal bone level have a more favorable prognosis than those at the level of the crestal bone. A surgical approach for repair would have caused considerable osseous damage. A one year follow-up revealed bone healing as a result of the MTA repair.

Case 22: A 71 yo female had an apicoectomy five years earlier. Tooth #13 had recently become symptomatic. The patient was informed that a root fracture was suspected due to the presence of a buccal sinus tract, mesio-palatal probing depth >6mm, and "J"-shaped apical radiolucency. Motivated to maintain this tooth, the patient elected to have the retreatment for further diagnosis. A vertical root fracture, along the internal canal walls, was able to be observed upon access with the SOM. The vertical root fracture was obvious upon extraction. In this situation, retreatment was a less invasive treatment than an apicoectomy in determining the prognosis for this tooth. Determining the probability of having a fracture prior to treatment is advantageous. Understanding the predictability of treatment is critical in maintaining patients’ confidence in dentistry.

Because the most common etiologies of failing root canal therapy can be addressed from within the tooth, endodontic retreatment is an important option to consider first when treating these teeth.

Should you or your team have any questions or have interest in gaining information pertaining to another aspect of endodontics, please contact our office at: Kevin B. Melker, D.D.S., M.S. 15237 Amberly Drive Tampa, FL 33647 813-978-3636