Active Nonsurgical Decompression of Large Periapical Lesions — 3 Case Reports

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Abstract

This paper describes a new nonsurgical approach for treating large periapical lesions which involves using a modified vacuum system within the root canal space. This new technique produces a vacuum effect in the periapical zone, which facilitates evacuation of large amounts of inflammatory fluids. This technique was used in 3 clinical cases, in which the patients presented with copious amounts of exudate draining from within the root canals. Clinical and radiographic results showed long-term resolution of the endodontic lesions. This treatment of the periapical pathology was consistent with the principles of conservative, nonsurgical endodontic procedures.

MeSH Key Words: *catheterization/instrumentation; periapical diseases/therapy; root canal therapy/methods*

© J Can Dent Assoc 2004; 70(10):691–4
This article has been peer reviewed.

Conventional nonsurgical root canal therapy is the treatment of choice in managing teeth with large periapical lesions.[1] When this treatment does not succeed in resolving the periradicular pathosis, additional options must be considered, such as nonsurgical retreatment or periapical surgery. In the case of very extensive lesions, the undesirable consequences of surgical curettage have led to the use of various marsupialization or tube decompression procedures.[2] Marsupialization is a surgical decompression procedure used to reduce large periapical lesions without periapical curettage.[3] Decompression allows continuous drainage from a periapical lesion to eliminate conditions favouring expansion of the apical pathosis. Over the years a variety of devices have been used in establishing drainage and decompression of large periapical lesions. Tsurumashi and Saito[3] described a method for long-term drainage and decompression of large lesions in which a stainless steel tube is inserted into the canal of teeth with persistent apical exudation. Freedland[4] described several cases in which patients were treated by the placement of polyvinyl or polyethylene drainage tubes through the alveolar mucosa over the apical lesion. Walker and Davis[5] described the placement of a stainless steel canula into the lesion through the involved tooth. However, these techniques were associated with a variety of problems. Patients were responsible for maintaining the patency of the canula, the polyvinyl or polyethylene tubes in the oral mucosa occasionally became displaced, and it was very difficult for patients to perform oral hygiene in the area.

Given that there is no clear consensus on the ideal method of drainage, the aim of this paper is to present an alternative method of treating large periapical lesions: decompression through the root canal space with a vacuum system.

Technique and Case Selection

In each of the cases described below, suction through the involved tooth was sustained for 20 minutes by means of the Endo-eze vacuum (Ultradent, Salt Lake, Utah). This system comprises a high-volume suction aspirator connected to a micro 22-gauge needle (**Fig. 1**). To test the method, patients with large periapical radiolucencies (greater than 200 mm^2 in size), open or closed apices, and copious drainage of exudate through the root canal space were selected. Local anesthesia was administered, a rubber dam placed, and conventional endodontic access prepared; sudden appearance of purulent exudate in the pulp chamber was interpreted as an indication of communication between the periapical lesion and the root canal. Cleaning and shaping of the canal was performed with stainless steel hand files in a step-down fashion, and the canal was then irrigated with 5.25% sodium hypochlorite, with care to avoid injecting the solution into the periapex of teeth with

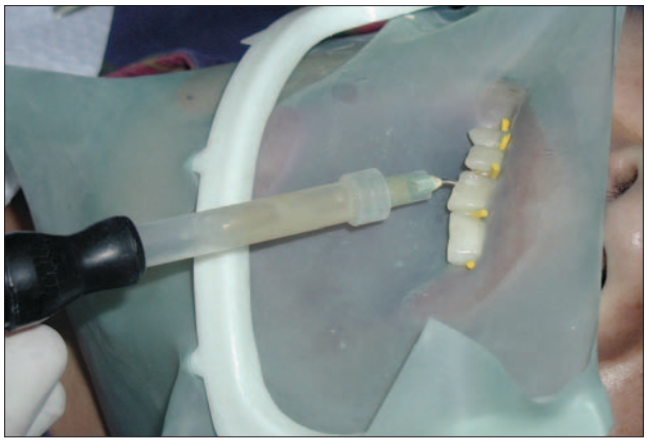

Figure 1: *Endo-eze vacuum system operating in the root canal.*

immature apices. The vacuum needle was inserted into the canal until binding at the apical third and negative pressure was felt. If it was not possible to sense the binding, a cotton pellet was placed in the pulp chamber to improve the vacuum effect in the periapical zone. The high-volume suction was activated, and the resulting negative pressure led to decompression of the lesion. When drainage had partially subsided, the access cavity was closed with a temporary restoration; no intracanal medicament was placed between appointments.

The procedure was repeated a week later and again at weekly intervals, if needed, until no evidence of exudate in the root canal could be detected. At that point, the canals were ready for obturation with gutta-percha. All patients were recalled for monthly follow-up. Any tooth with a mature apex was subjected to obturation immediately after drainage of the exudate ceased. Any tooth with an open apex was obturated with thermoplasticized gutta-percha.

Clinical Reports

Case 1

A healthy 9-year-old girl was referred to the endodontist for treatment of a large periapical lesion around her right maxillary central incisor. Clinical examination revealed tenderness to palpation and percussion; unlike the adjacent teeth, the central incisor did not respond to cold and electrical tests. The periapical lesion measured about 1.6 cm in diameter on radiography (**Fig. 2**). The tooth was anesthetized, isolated and accessed, and a significant amount of exudate drained out through the point of access. The Endo-eze vacuum system was used intermittently before, during and after cleaning and shaping of the canal. The patient was recalled weekly for 2 more appointments to repeat the decompression procedure. At the end of the third session, the canal was completely dry, which allowed intracanal placement of calcium hydroxide to induce apexification and to prevent bacterial contamination. After 14 months, closure of the root canal was clinically and radiographically evident, and the canal was obturated with thermoplasticized gutta-percha. There was complete resolution of the apical lesion (**Fig. 3**), and the root canal was sealed with thermoplasticized gutta-percha (**Fig. 4**).

Case 2

An 18-year-old man presented with a large periapical radiolucency, about 3 cm in diameter, around the left maxillary lateral incisor and canine (**Fig. 5**). He had been referred with a diagnosis of acute apical abscess and had been receiving penicillin V since the previous day. There was labial swelling over the aforementioned teeth, and the area was tender to palpation and percussion. The results of pulpal and thermal tests in both teeth were negative. The teeth were anesthetized, isolated and accessed. Upon access, the lateral incisor drained purulent exudate, which was aspirated with the Endo-eze system. However, the maxillary canine did not drain, so the suction system was not used for this tooth. The root canals were cleaned, shaped and irrigated with 5.25% sodium hypochlorite.

The patient was recalled after 1, 2 and 4 weeks, and the vacuum technique was repeated on the lateral incisor. The canine and the lateral incisor were obturated at 1 and 4 weeks, respectively, after treatment was initiated. After 3 months, the clinical symptoms subsided and partial radiographic resolution was seen (**Fig. 6**); after 8 months, there was complete radiographic resolution of the periapical radiolucency (**Fig. 7**).

Case 3

A healthy 11-year-old girl presented for endodontic treatment of traumatized maxillary left and right central incisors. The patient had previously presented to her general dentist with sinus tracts on the labial soft tissue over the central incisors. The dentist had accessed both teeth, but because he could not control the draining exudate, he referred the patient to the endodontist. As seen radiographically (**Fig. 8**), the periapical lesions were about 1.5 cm in diameter, and both central incisors presented with incomplete apical root development.

Teeth 11 and 21, along with tooth 12, did not respond to thermal and electrical pulp tests. Pulpal necrosis was diagnosed, and the teeth were subjected to nonsurgical endodontic treatment. Once the teeth had been anesthetized, isolated and accessed, copious amounts of exudate drained via the coronal access points of the central incisors, but there was no drainage from the lateral incisor. The Endo-eze vacuum system was used for 20 minutes in each central incisor (**Fig. 9**). The left central incisor was medicated with calcium hydroxide and access was temporarily restored with Vitremer (3M Dental Products, St. Paul, Minn.). One month later the teeth were reopened, and no evidence of exudate was detected. The teeth were remedicated with calcium hydroxide to prevent bacterial

Figure 2: *Case 1. Periapical radiograph shows radiolucency approximately 1.6 cm in diameter associated with the immature apex of the right maxillary central incisor.*

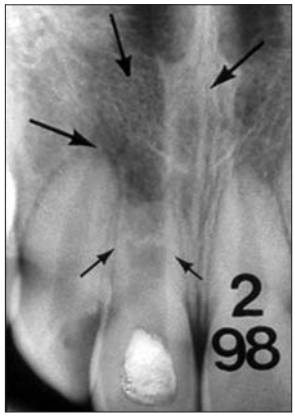

Figure 3: *Case 1. Fourteen months later, apexification was complete. The smaller arrows indicate the apical barrier, and the larger arrows indicate the area of healing.*

Figure 4: *Case 1. Postobturation radiograph. The root canal was sealed with thermoplasticized gutta-percha.*

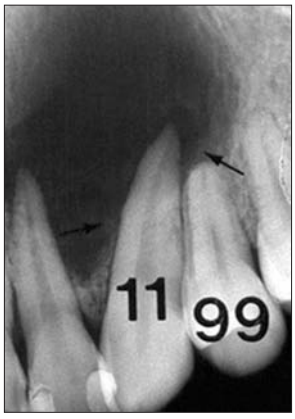

Figure 5: *Case 2. Periapical radiograph shows a radiolucency about 3 cm in diameter around teeth 22 and 23.*

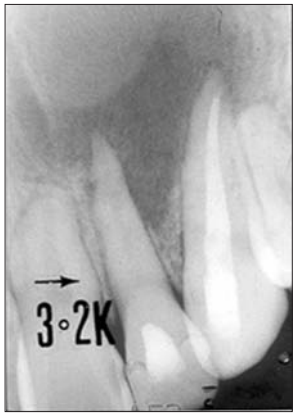

Figure 6: *Case 2. Three months after treatment was initiated, radiographic evidence shows significant healing.*

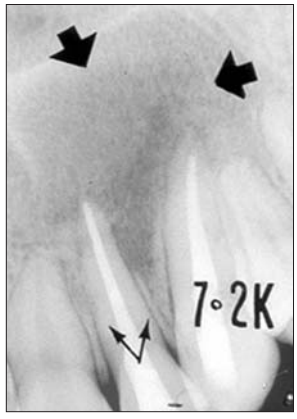

Figure 7: *Case 2. Eight months after initiation of treatment, there was complete radiographic resolution.*

contamination and to achieve apical closure. Three months later, radiography showed almost complete periapical healing and partial root development in the central maxillary incisors (**Fig. 10**). Eight months later, when apexification was complete, the teeth were obturated with thermoplasticized gutta-percha.

Discussion

The treatment options for large periapical lesions may range from conventional nonsurgical root canal treatment with long-term calcium hydroxide therapy to various surgical interventions. Leaving the access point open for continued drainage is not a new procedure, and this technique has often been used for cases in which the endodontic lesions are large and the exudate from the root canal cannot be controlled.[3–6]

This paper describes an active decompression technique incorporating a new vacuum system. The technique facilitates evacuation of apical inflammatory fluids via the radicular canal, without passing through the apical constriction. Other decompression techniques intended to reduce the size of the lesion[3–6] have been effective; however, they depend on patient cooperation, they take a long time, and they do not maintain the basic principles of endodontic therapy, especially with regard to the bacterial contamination through the oral environment. In addition, these techniques have involved use of a surgical technique, causing pain, swelling and discomfort to the patient.[3] In contrast, the technique described in the present report involves a change in pressure. The vacuum system produces a negative pressure, which can be felt by the patient and which may alter the structure of the lesion.

The results of tests of intracanal therapy with calcium hydroxide have been inconclusive.[2,7] In some cases, medication with calcium hydroxide continued between appointments, but in other cases this did not occur. For example, in case 3 in this report, the decompression technique was used in 2 of the teeth with independent apical rarefaction, but in only one of these was calcium hydroxide used to medicate the canal. The canal of the other tooth was left empty and a coronal restoration was used to avoid coronal leakage in both teeth and thus to evaluate the efficiency of

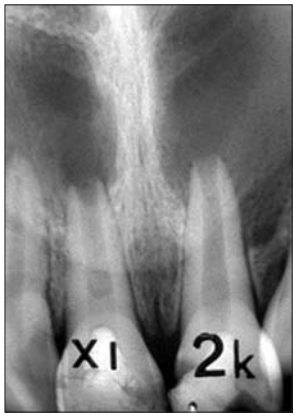

Figure 8: *Case 3. Large periapical radiolucencies are evident around teeth 12, 11 and 21. The cental incisors have immature apices.*

Figure 9: *Case 3. The Endo-eze suction tube in position within the root canal of tooth 11.*

Figure 10: *Case 3. Three months after treatment was initiated, radiographic evidence shows healing is almost complete, and further root development is evident.*

the decompression technique. After 3 months, the degree of healing was similar in all 3 teeth.

Long-term resolution of the endodontic lesions was achieved in all 3 cases reported here. This decompression technique could be used as an alternative to apical surgery for large areas of rarefaction involving anatomic structures.

This technique could also be a good alternative to surgical and nonsurgical endodontic treatment of teeth with large apical lesions, and it could be used in cases where there is direct communication between the root canal and the periapical lesion. However, the question remains whether a patency file could be used to allow application of the vacuum technique in teeth with acute apical abscess.

Additional research should be done to analyze the effect of the vacuum technique on the structure of various lesions (e.g., granuloma, cyst) and the adjacent bone surrounding the lesion.

Conclusions

Use of a vacuum system to apply negative pressure to large apical lesions enabled rapid removal of the periapical exudate through the root canal in teeth with immature apices. This technique respects the basic principles of endodontic therapy, in that the source of bacteria is eliminated through the root canal, the access cavity is kept closed during the whole procedure and the apical foramen is kept intact without altering its position or size.

Active nonsurgical decompression offers the following practical benefits over other techniques:

- The patient experiences less discomfort because no surgical procedures (such as marsupialization or surgical decompression techniques) are required.
- The root canal has no access to the oral environment, which helps in maintaining bacterial control.
- The patient does not have to perform any cleaning, as is the case for surgical decompression or marsupialization.
- It saves time for both the patient and the dentist.
- Invasiveness is minimal because the entire procedure is done through the root canal without compromising anatomic structures, bone or soft tissue. Furthermore, the method allows better healing. ❖

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The authors have no declared financial interests.

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