Apical infection spreading to adjacent teeth: a case report

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This case report describes apical infection on tooth number 24 that spread to adjacent teeth, resulting in devitalized teeth numbers 23 and 25. The 25-year-old Caucasian female patient was referred to the endodontic resident clinic because of uncontrolled apical infection. Root-end surgery and root-end filling of teeth numbers 23, 24, and 25 were performed. The histopathological diagnosis was a periapical cyst; however, the clinical surgical finding of a purulence-filled bone cavity also revealed a periapical abscess. After root-end surgery and regenerative therapy using Mineral Trioxide Aggregate, Bio-Oss xenograft material, and Bio-Gide resorbable collagen membrane, the patient had no symptoms. Radiographs showed the apical lesion had healed satisfactorily at the 6-month, 1-year, and 2-year follow-ups. The clinical implication of this rare case suggests the importance of standard endodontic diagnostic procedures for pulp and apical diagnosis, prevention of apical periodontitis exacerbation by reducing bacterial factors, and the effectiveness of healing large bone defects using regenerative materials. (Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2011;111:e15-e20)

Pulp necrosis and apical lesion deployment occur only when oral microbiota exist; they do not occur when there is no oral microbiota in the root canals of pulpless teeth.1,2 Nonsurgical root canal treatment has a very high success rate in teeth with apical periodontitis;3,4 therefore, a necrotic tooth with apical periodontitis is generally treated by nonsurgical root canal treatment alone.

However, in this case, the apical periodontitis did not respond to root canal treatment; instead, the apical infection spread to the adjacent teeth. Without apparent caries or mechanical damage, the pulp status of the adjacent teeth changed from vital to necrotic. Similar case reports involving devitalized neighboring teeth or damaged adjacent vital structures are scarce.5-8 Therefore, this case is extremely rare because it is most likely caused by exacerbating infection that spread to neighboring teeth.

The purpose of this case report is to describe apical infection that spread to adjacent teeth and the management of this case using root-end surgery and regenerative therapy.

CASE REPORT

Root canal treatment on tooth number 24

A 25-year-old Caucasian female visited a student provider at the University of Connecticut predoctoral clinic for comprehensive dental care. The patient’s medical history was noncontributory, and she presented with no symptoms. The patient had large caries on the distal of tooth number 24, and a radiographic evaluation indicated a well-defined 7 × 7-mm circumscribed radiolucency at the apex of tooth number 24.

Endodontic examination and tests, such as percussion, palpation, cold tests (Hygenic Endo-Ice, Coltene Whaledent), and electric pulp test (EPT, Analytical Technology) were conducted. The results of these objective endodontic examinations are summarized in Table I, section A.

The pulp diagnosis of tooth number 24 was pulp necrosis, and the apical diagnosis was asymptomatic apical periodontitis. Notably, the pulp diagnosis of teeth numbers 23 and 25 were normal (vital pulp), and the apical diagnosis was normal apical tissues by summarizing all of the information, such as symptoms, clinical findings, radiograph, and objective endodontic examinations. The root canal therapy of tooth number 24 was completed in 2 visits by the student provider. The final radiograph showed that the root filling of tooth number 24 was 1.5 mm short of the apex (Fig. 1).

Root canal treatment of teeth numbers 23 and 25

Four months after completion of the root canal therapy of tooth number 24, the patient presented with pain in her lower front teeth. A second student provider conducted the objective endodontic examinations summarized in Table I, section B.

The apical radiolucency had enlarged to approximately 17 × 10 mm (Fig. 2). The pulp diagnosis of teeth numbers 23 and 25 was pulp necrosis, and the apical diagnosis was...
symptomatic apical periodontitis. The treatment plan was root canal treatment on teeth numbers 23 and 25 and retreatment of number 24. Root-end surgery was possible owing to the size of the lesion but in this instance, root canal therapy was started by the second student provider on teeth numbers 23 and 25. After access preparation, the pulp was found necrotic with no bleeding, which confirmed the diagnosis and the vitality test findings. Two visits for endodontic treatment using calcium hydroxide as an interappointment canal medicament were conducted on teeth numbers 23 and 25. On follow-up, the patient reported some relief from the symptoms. Then, the root canal treatment was completed by her second student provider. The final radiograph (Fig. 3) showed the presence of a large ill-defined periradicular radiolucency (approximately 20 × 12 mm in diameter) associated with broken lamina dura at the apices of teeth numbers 23, 24, and 25. Sealer extrusion was seen at the apex of tooth number 25.

**Patient referral to endodontic resident clinic because of uncontrolled apical infection**

One week after the completion of the root canal treatment on teeth numbers 23 and 25, the patient complained of feeling

<table>
<thead>
<tr>
<th>Tooth no.</th>
<th>22</th>
<th>23</th>
<th>24</th>
<th>25</th>
<th>26</th>
<th>27</th>
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<td>A. Initial presentation</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
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<tr>
<td>Percussion</td>
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<tr>
<td>Endo-ice</td>
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<td>+</td>
<td>-</td>
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<tr>
<td>EPT</td>
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</tr>
<tr>
<td>B. 4 mo after root canal filling of tooth number 24</td>
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<td>Moderate</td>
<td>Moderate</td>
<td>-</td>
<td>-</td>
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<tr>
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<td>Mild</td>
<td>Mild</td>
<td>-</td>
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<tr>
<td>Palpation</td>
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<td>N/A</td>
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<td>Endo-ice</td>
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<td>N/A</td>
<td>N/A</td>
<td>+</td>
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<tr>
<td>C. 1 wk after root canal filling of teeth numbers 23 and 25</td>
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<td>Mild</td>
<td>Mild</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Percussion</td>
<td>-</td>
<td>Mild</td>
<td>Mild</td>
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<tr>
<td>Endo-ice</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
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<td>+</td>
</tr>
</tbody>
</table>

+, response; -, no response; Mild, mild pain; Moderate, moderate pain; N/A, not applicable.

Fig. 1. Radiograph after root canal filling of tooth number 24.

Fig. 2. Radiograph 4 months after root canal filling of tooth number 24.
discomfort and pressure, especially when she pushed on her chin area. She was then referred to the resident clinic for further evaluation and treatment. There was no history of trauma to this area.

Clinical examination revealed submandibular lymphadenopathy. The patient felt discomfort when the chin area was palpated. During the intraoral examination, teeth numbers 23, 24, and 25 exhibited mild tenderness to palpation in the labial vestibule. The endodontic evaluations are summarized in Table I, section C.

Based on the clinical and radiographic information, the pulp diagnosis of teeth numbers 23, 24, and 25 was previously treated, and the apical diagnosis was symptomatic apical periodontitis. The patient was informed that the continuous enlargement of the periradicular radiolucency with ill-defined borders suggested that the periradicular infection had not been controlled despite the root canal therapy. A treatment plan was presented to the patient that included the retreatment of tooth number 24 and root-end surgery of teeth numbers 23, 24, and 25. However, the patient did not want to have tooth number 24 retreated because of her experience with root canal therapy in the previous several months. She was very concerned with the continuous growth of the apical

Fig. 3. Radiograph after root canal filling of teeth numbers 23 and 25.

Fig. 4. Root-end surgery on teeth numbers 23, 24, and 25. A, Purulent exudate was seen as the flap was being reflected near the apical area of teeth numbers 23, 24, and 25. B, Inflamed periosteum. C, Periradicular lesion. D, Removed tissue attached to the apex of tooth number 24 for biopsy. E, Root-end preparation. F, Root-end filling with white MTA. G, Bio-Oss was placed into the bony crypt. H, Bio-Gide membrane was placed.
lesion and wanted to proceed with the surgical endodontic therapy as soon as possible.

Root-end surgery on teeth numbers 23, 24, and 25

Root-end surgery was performed 1 week after consultation. As the flap was being reflected near the apical area of teeth numbers 23, 24, and 25, significant purulent exudate was evident (Fig. 4, A). An inflamed periosteum overlaid the purulence-filled bone cavity (Fig. 4, B). Dehiscence of the buccal cortical bone was noticed (Fig. 4, C). Inside the bone crypt, tissue of 10 × 8 × 4 mm was attached to the apex of tooth number 24. The tissue was removed and submitted for biopsy (Fig. 4, D). A root-end cavity was prepared (Fig. 4, E) and filled with White ProRoot Mineral Trioxide Aggregate (MTA) (Dentsply, Tulsa Dental, Johnson City, TN) (Fig. 4, F). Bio-Oss (Osteohealth, Shirley, NY) (0.75 mg) was used to fill the bony defect (Fig. 4, G). Then, a Bio-Gide (Osteohealth) resorbable collagen membrane was placed to cover the bony defect (Fig. 4, H). The flap was sutured and a radiograph taken (Fig. 5, A). Postoperative instructions to take antibiotics and pain medication were given to the patient.

Postoperative evaluation

The postsurgery follow-up found that the soft tissue was healing well, and the patient’s symptoms had improved. During the 6-month (Fig. 5, B), 1-year (Fig. 5, C), and 2-year (Fig. 5, D) follow-ups, the patient had no symptoms, and the radiographs showed the apical lesion had healed completely.

Pathology report

The pathology report revealed a well-delineated cyst lined partially by a somewhat hyperplastic, but nonkeratinized, stratified squamous epithelium. The wall was slightly thickened and fibrotic and contained a mild-to-moderate mixed inflammatory response (Fig. 6, A and B). The histopathological diagnosis was periapical cyst; however, the clinical surgical finding of a purulence-filled bone cavity also revealed periapical abscess.

DISCUSSION

At the beginning stages of this case, tooth number 24 had necrotic pulp with apical periodontitis, whereas teeth numbers 23 and 25 had vital pulp with normal apical tissue. However, 4 months after nonsurgical treatment on tooth number 24, teeth numbers 23 and 25 developed necrotic pulp. During this period, no caries, trauma, or fracture was observed on these teeth. Accordingly, the authors speculated the following about this case.

Another reason for the lack of response from tooth number 24 to treatment was the cystic lesion. The lesion of tooth number 24 expanded laterally to teeth numbers 23 and 25 owing to the thickness of the cortical bone and the thin anatomical structure in the anterior teeth area of mandible. According to Skaug, fluid pressure in odontogenic jaw cysts is higher than the atmospheric pressure. It has been speculated that increased intracystic fluid pressure might activate the growth of odontogenic jaw cysts. Large cystic and periapical lesions are difficult to heal using only nonsurgical root canal treatment. The clinical findings in this case indicated that the lesion may be a pocket cyst. The radiograph (Fig. 1) shows a well-defined...
circumscribed radiolucency with a well-defined cortical border, which was interrupted by the apex of tooth number 24. During surgery, tissue was found attached to the apex of tooth number 24 and needed to be separated for the biopsy.

The pulp infection of teeth numbers 23 and 25 presents bacteria that could spread extraradicularly to neighboring teeth. Anachoresis has been investigated to explain the presence of microorganisms in unexposed dental pulps.17,18 Bacteria introduced into the gingival sulcus or bloodstream were recovered in teeth with pulp inflammation.17-19 It was attributed to the destruction of the pulp vessels and the increased vascular permeability resulting from inflammation.19 As teeth numbers 23 and 25 were heavily restored, a level of inflammation may have existed that possibly led to the ingress of bacteria retrograde from the acute apical abscess of tooth number 24.

Because the apical infection was not properly controlled despite the root canal therapy on teeth numbers 23, 24, and 25, root-end surgery and root-end filling of these teeth were performed. Root-end surgery is needed for large apical cystic lesion healing20; the success rate of root-end surgery is approximately 90%.21-24

In a previous case report regarding the periapical lesion involvement from 1 tooth to adjacent teeth, 2 collagen membranes were placed around the bony defect and stabilized using titanium pins.5 In our case, Bio-Oss xenograft material was used to fill the large bony defect to effectively maintain space and promote revascularization and clot stabilization. Bio-Gide resorbable collagen membrane was used to cover the bony defect. This membrane serves as the matrix for soft tissue support and inhibits soft tissue ingrowth into the underlying bone defect. A 2-year follow-up showed that the outcome was excellent; both the graft material and membrane appeared to have facilitated large apical lesion healing.

In summary, this rare case shows that apical infection from 1 tooth may spread to the adjacent teeth. Large apical cysts may be difficult to heal and regenerative materials may be useful in healing large bone defects.

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REFERENCES


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