

PULP REVASCULARIZATION OF AN IMMATURE TOOTH WITH APICAL PERIODONTITIS: A CASE REPORT

APİKAL PERİODONTİTİS İZLENEN İMMATÜR DİŞ PULPASININ REVASKÜLARİZASYONU: VAKA RAPORU

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ABSTRACT

This case report describes biologically based treatment of a necrotic immature lower left second premolar with severe periapical infection. A different clinical approach to treat cases indicated for apexification has been advocated. Revascularization of teeth with necrotic infected canals has been reported by using combinations of antibiotics. This case report details the outcome of an 8-year-old girl who presented with a successful revascularization procedure of tooth #20. After NaOCl irrigation and medication with triantibiotic mix (ciprofloxacin, metronidazole, and minocycline), bleeding was stimulated to form an intracanal blood clot, and mineral trioxide aggregate was placed coronally to the blood clot. The patient was asymptomatic and apical periodontitis was resolved. There was radiographic evidence of continuing thickness of dentine walls with closure of the apex. Pulp revascularization could be an alternative treatment procedure of immature permanent teeth with apical periodontitis.

Keywords: revascularization, apexification, immature teeth, apical periodontitis

ÖZET

Bu vaka raporu ileri derecede periapikal enfeksiyonu bulunan nekrotik immatür sol alt ikinci küçük azı dişin biyolojik esaslı tedavisini anlatmaktadır. Apeksifikasyon tedavisi gerektiren vakalarda farklı klinik yaklaşımlar ileri sürülmektedir. Nekrotik enfekte kanallı dişlerin revaskülarizasyonu antibiotik kombinasyonu kullanılarak yapıldığı rapor edilmiştir. Bu vaka raporunda 8 yaşındaki kız çocukta #20 no'lu dişe ait başarılı bir revaskülarizasyon işleminin bulgularını rapor edilmektedir. Bu vakada, NaOCl irrigasyonu ve üçlü antibiyotik pat (siprofloksasin, metronidazol ve minosiklin) uygulamasından sonra kanal içi pıhtı oluşumunu stimule edilerek mineral trioksit agregat korondan pıhtı formasyonunun üzerine yerleştirilmiştir. Hastanın şikayetleri ortadan kalkarak ve apikal periodontitis tedavi edilmiştir. Radyografik olarak apekteki kapanma ile birlikte dentin duvarlarındaki kalınlaşma izlenmiştir. Pulpa revaskülarizasyon işlemi apikal periodontitis izlenen dişlerde alternatif tedavi yöntemi olabilmektedir.

Anahtar kelimeler: revaskülarizasyon, apeksifikasyon, immatür dişler, apikal periodontitis

INTRODUCTION

Apexification is a clinical procedure to promote the formation of an apical barrier to close the open apex of an immature tooth with a nonvital pulp¹. The traditional endodontic management of immature tooth with a nonvital pulp includes debriding the root canal, disinfecting the space, and final obturation of the canal either by an apexification

procedure or by developing an apical barrier by using materials such as mineral trioxide aggregate (MTA).¹⁻⁴

Although the clinical technique for apexification has been widely practised, some authors modify their treatment procedures based on their clinical judgment. A call for a paradigm shift and different clinical approach to treat cases indicated for apexification has been advocated.⁵⁻¹¹ This paradigm shift that is more

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conducive to tissue regeneration has been considered to be a better option for treating with immature teeth with nonvital pulp and even for cases with severe periapical infection.^{9, 10} The advantage of this approach is twofold: (i) it takes only 2 to 3 visits within a few weeks span, and (ii) it gains root thickness and potentially root length.¹²

The key factor for the success of this procedure is to establish a suitable environment in the root canal system. First, intracanal infection should be eliminated, and then the infected but necrotic pulp has acted as a scaffold, permitting the ingrowth of new tissue from the periapical area. A mixture of ciprofloxacin, metronidazole, and minocycline has been shown to be able to disinfect the infected root canal system.¹³ Then, according to typical revascularization protocol, in the absence of symptoms, the tissue is irrigated until bleeding is started and a blood clot produced⁶, and then MTA is placed over the blood clot. Within the next two years an increase in the root development can be observed.^{5-7, 14}

The current case report describes the use of this protocol to stimulate the continued root development in a case of necrosis and with severe periapical infection of the lower left second premolar.

CASE REPORT

An 8-year-old girl was referred for evaluation and treatment of the lower left second premolar (tooth #20). The girl had a history of swelling of the left mandibular buccal vestibule. The patient was accompanied by her mother, who reported that her daughter had a fixed appliance on this region of mandibula for two years then; this appliance was removed when the lower left first permanent molar had erupted. After researching patient dental records, it has been noticed that her lower left second primary molar had been extracted and then distal shoe space maintainer was inserted to protect the eruption position of the first permanent molar (Fig 1a). In clinic application of distal shoe appliance, the male attachment of should be extend to the most distal aspect of the extraction socket. However, in this case, the position of distal shoe appliance was not established correctly and also, distal shoe appliance changed the position of tooth bud (Fig 1b). The medical history of the girl was not remarkable. On

clinical examination, the patient was slightly symptomatic to percussion. The tooth #20 was free of caries but, hypomineralization defects of the occlusal tubercles were noted on visual inspection (Fig 2). Diagnostic testing was inconclusive on cold and electric pulp testing, with sensitivity noted after percussion or palpation. The periodontal probings were within normal limits for the tooth. Periradicular radiographic examination revealed that tooth #20 had an incomplete apex and periradicular radiolucency (Fig 3). The procedure, possible discomfort, or risks as well as possible benefits were explained fully to parent and child.

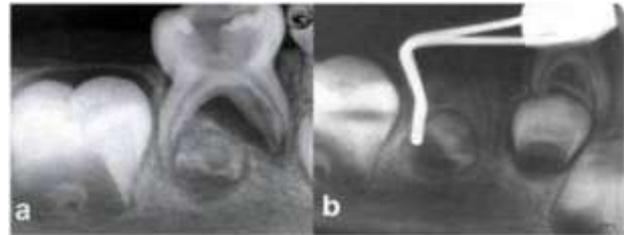


Figure 1. (a) a second primary molar that requires extraction due to periapical bone destruction. (b) distal shoe appliance changed the position of tooth #20 bud.



Figure 2. Clinical observations. Hypomineralization enamel defect is visible of the occlusal tubercles.



Figure 3. Radiographic image showing an incompletely developed apex and a periradicular radiolucency of tooth # 20.

The tooth was isolated, and a purulent hemorrhagic exudate discharged from the canal was evident when the access cavity was made. The root canal system was irrigated with 2.5% NaOCl for 30 minutes, the canal was then dried, and a mixture of ciprofloxacin, metronidazole, and minocycline paste was placed by using a lentulo spiral as described by Hoshino et al.¹³ The patient returned 10 days later and denied a history of postoperative pain. The root canal was slowly flushed with 10 mL of 2.5% NaOCl and irrigation was maintained with same solution for 15 minutes. To evaluate whether vital tissue presented in the root canal, a size #80 gutta-percha cones was introduced into the canal until the patient reported some sensitivity. A size #35 K-file was used to irritate the tissue gently to create some bleeding into the canal. The bleeding was left for 15 minutes to permit blood clotting. MTA was carefully placed over the blood clot. Since the blood clot was so fragile that some of MTA extruded into the middle third of the root canal; then it was covered with a moist cotton pellet, and the access was sealed with Cavit. Three weeks later, the patient returned, asymptomatic, and the Cavit and cotton pellet were replaced with a bonded resin restoration. At the 9-month recall, the patient was asymptomatic, and the radiograph showed complete resolution of the radiolucency, with some continued development of the apex was detected (Fig 4). At the 24-month follow-up, the patient continued to be asymptomatic. A bonded resin restoration was applied distal defect of crown. It was evident that the dentinal walls displayed continued thickening with closure of the apex (Fig 5).



Figure 4. Radiograph demonstrating complete resolution of the radiolucency, with some continued development of the apex at 9-month follow-up.



Figure 5. Radiograph demonstrating excellent periapical healing at 2-year follow-up.

DISCUSSION

This case report described the outcome of girl patient who presented with immature permanent teeth with apical periodontitis. The first, reported by Iwaya et al.⁵ (2001) presented an immature mandibular premolar with sinus tract and periradicular radiolucency. In that case, the canal was mainly irrigated with NaOCl and hydrogen peroxide and further disinfected with antibiotic agents. Thirty-five months after the completion of these procedures, they observed complete maturation of the root apex with thickened root structure. Jung et al.¹⁴ (2001) later reported case series of 8 patients who presented with 9 immature permanent teeth with pulpal necrosis and apical periodontitis. In that case series, all teeth were associated with dens evaginatus, where occlusal tubercle might often fracture, predisposing the teeth to bacterial infection.¹⁵ In this case report, the crown

defect, pulpal necrosis and apical periodontitis might be due to the wrong application of distal shoe appliance or tooth #20 could have been affected by the intra coronal inflammation due to the pulp pathology of the second primary molar.

Revascularization of teeth with necrotic infected canals has been reported by using combinations of antibiotics.^{5, 6} In this case, three antibiotics combination was used as described by Hoshino et al.¹³, and an effort was made to evoke an intracanal blood clot to trigger tissue ingrowth. The triple-antibiotics regimen was first tested by Sato et al.¹⁶ to be effective against the *Escherichia coli* infected dentin in vitro. The clinical effectiveness of the triple-antibiotic paste in the disinfection of immature teeth with apical periodontitis has been reported.¹⁷ However, clinicians should take into consideration that the patients should not have any history of hypersensitivity to any of drugs used.

It was recommended by the authors in these case reports that calcium hydroxide, (Ca(OH)₂), is not recommended as intra-canal medicament to prevent damage of the remaining pulp tissue, apical papilla and Hertwing's epithelial root sheath (HERS).^{6, 7} Ca(OH)₂ may damage the HERS and thereby losing its ability to induce the nearby undifferentiated cells to become odontoblasts.⁶ Moreover, if there is remaining vital pulp tissue in the canal, the direct contact of Ca(OH)₂ paste with the tissue will induce the formation of a layer of calcific tissue which may occupy the pulp space therefore preventing the pulp tissue to regenerate into that space.⁹

In this clinical approach, hemorrhage was induced by an endodontic explorer penetrating slightly into the remaining pulp tissue or periapical tissue allowing the blood clot to form in the canal and stopped at a level 3 mm below cement-enamel-junction. MTA was then placed over the blood clot. It has been considered that the blood clot act as a scaffold and source of growth factors to facilitate the regeneration and repair of tissues into the canal.^{6, 18} In this case, same protocol was applied to tooth #20. On the other hand, Jung et al.¹⁴ reported that the treatment of first 4 patients was administered without an attempt to trigger bleeding and the formation of an intracanal clot.

Recently, it has been shown histologically the types of tissues that had grown into the canal space of

these teeth. Wang et al.¹² reported that bone or bone like tissue was observed in the canal space. They also suggested that these tissues were not pulp parenchymal tissue and did not function like a pulp.

This case report demonstrated that biologically based treatment of immature permanent teeth with apical periodontitis is a clinical possibility. However, further investigations should be performed in order to determine the relative advantages and potential risks of this clinical procedure.

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