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Case Study

Regenerative endodontic theraphy with chlorhexidine

Hasan Hüseyin Sancak*, Aslı Patır Münevveroğlu*

*Istanbul Medipol University Faculty of Dentistry

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ABSTRACT:

Introduction : Traumatic injuries in the permanent teeth with immature root formation can cause the accumulation of dentin and root maturation to stop. Endodontic treatments of immature teeth often have a complex and uncertain prognosis. In this case report, it is intended to present revascularization therapy using 2% chlorhexidine gel instead of antibiotic paste.

Case report: Mandibular second premolar tooth that is infected owing to decay of the 9-year-old girl was restored by applying revascularization therapy. One-year of follow-up, an increase in root thickness, root development continued and the formation of new dentin were observed.

Conclusion: It is thought that revascularization therapy performed by using 2% chlorhexidine gel as an antibacterial agent may be an alternative to conventional apexification therapy for immature teeth.

Keywords: Apexification, Chlorhexidine, Immature permanent teeth, Pediatric dentistry, Revascularization

INTRODUCTION:

The need for root canal treatment may occur due to trauma or caries in the immature teeth. However, mechanical cleaning and shaping of these teeth during root canal treatment is difficult due to their anatomical properties (1-3). In addition, root fractures may occur because of thin dentin walls during mechanical filling or during lateral condensation (4,5). Endodontic treatment options for these teeth include apexification, artificial apical barrier building and revascularization therapy (6).

Traditionally; In the treatment of permanent teeth that have a necrotic pulp and have not completed root development, apexification therapy is applied with long-term calcium hydroxide [$Ca(OH)_2$] in order to completion the root apex (7). Apexification; it is defined as a method that creates a calcified barrier in teeth with open apex or allows the development of root form in teeth with necrotic pulp (8). Although the rate of periapical healing and hard tissue formation in the treatment of apexification with $Ca(OH)_2$ is stated to be between

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79% and 96%, studies by Andreasen and Rosenberg show that prolonged use of $Ca(OH)_2$ weakens dentin and increases the risk of breakage (10,11). There is a risk of re-infection, so teeth are temporarily closed during this treatment process, and since permanent restoration is delayed, the risk of breaking teeth also increases (12). In the treatment of apexification, it is recommended to create an artificial apical sealing with mineral trioxide aggregate (MTA) as an alternative to the use of $Ca(OH)_2$ (13).

MTA is an appropriate apical sealing material due to its effective apical sealing feature (14.15), biocompatibility (16,17) and having sufficient working time (average 4 hours) (12). Furthermore, this application does not physiologically provide apical closure and thickening of the root dentin (7, 10).

Ideal treatment method for providing root development and maturation of dentin walls in teeth with necrotic pulp; is revascularization that allows regeneration and repair of pulp dentin complex and restores pulp vitality. Revascularization; in teeth with necrotic pulp that have not completed root development is a treatment process that regenerates the vascularity in the pulp cavity and provides the order of root development and the healing of apical periodontitis in that region (4).

Revascularization therapy is used for the treatment of necrotic immature teeth, it is a regenerative and biologically based treatment that, unlike other techniques, provides the continuation of root development (5). In the treatment of classical revascularization, after the root canals are disinfected with various antibiotic pastes, periapical tissues are irritate and bleeding is provided inside the root canal and the blood clot that is occurring within the root canal is covered with MTA. It has been shown in many cases that when root development is not expected, revascularization treatment can be applied instead of apexification thanks to this method (1, 2, 18-20).

Triple antibiotic pastes applications are widely used in revascularization treatments. In this treatment protocol, triple antibiotics consisting of metronidazole, minocycline and ciprofloxacin are prepared in a ratio of 1:1:1, mixed homogeneously with distilled water or glycerin and formed to paste form and applied into the root canal (21). Triple antibiotic paste can cause bacterial resistance and allergic reactions, at the same time minocycline in its content is connected to calcium ions with chelation and form an insoluble structure. This situation causes coloring in the tooth, which makes it limited in its use in the root canals (22,23). For this reason, $Ca(OH)_2$ and 2% chlorhexidine digluconate (CHX) gel combination, which were mixed in 1:1 ratio in many studies as an alternative to triple antibiotic paste, were prepared in pat consistency and tried to be used in the treatment of revascularization (24,25). In this case report, the success of revascularization therapy using 2% chlorhexidine gel in the immature tooth, which is thought to be weak prognosis if root development is not expected and if apexification or artificial apical barrier building technique is applied, is evaluated.

Case Report: After radiographic examination, it was observed that the apex of this tooth was open and periapical lesion developed in a 9-year-old girl who was admitted to our clinic with pain and cavity formation due to decay in her lower left first premolar tooth (fig.1a,b).

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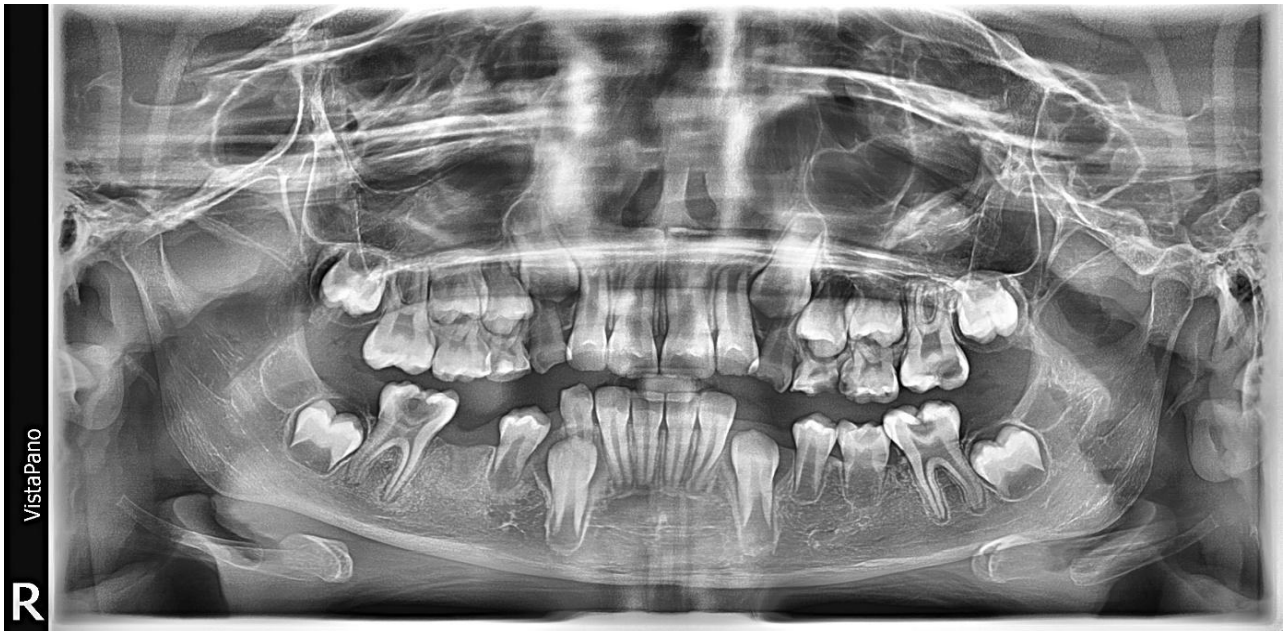

Fig.1a. Initial panoramic radiograph

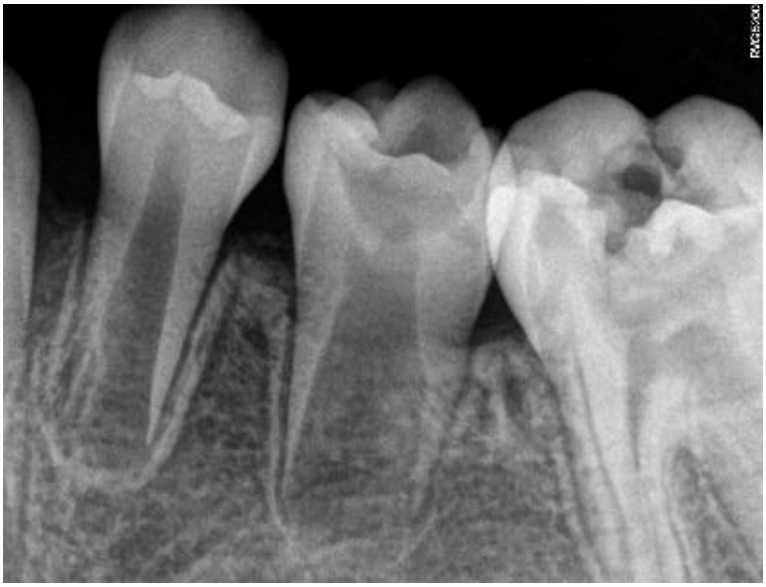

Fig.1b. Initial periapical radiograph

As a result of the clinical examination, it was determined that there was percussion sensitivity but not palpation sensitivity. This tooth was determined to be devital after not responding to an electric pulp test or cold test. Under rubber dam isolation, the endodontic cavity was opened without anesthesia and the patient did not feel any discomfort until the endodontic files reached the periapical region.

Based on this situation, it was thought that periapical tissue is vital. The canal was washed with 10 ml. sodium hypochlorite and dried with the help of paper points and 2% chlorhexidine gluconate gel (Gluco-CHex, Cercamed, Stalowa Wola, PL) was injected into the canal in order to provide intra-canal disinfection.

The entrance Cavity was closed with temporary filler (Cavit, 3M ESPE, GER) and it was waited for 3 weeks.(fig.2) After 3 weeks, no pathological findings were found in the patient. After the canal was reopened by applying adrenaline-free local

Corresponding Author: Hasan Hüseyin Sancak

anesthesia (Safecaine, VEM, Ankara, Turkey) and rubber dam, the canal was washed with 10 ml. sodium hypochlorite and dried with paper points in order to clean the chlorhexidine gel inside the root canal.

Periapical tissues were irritated and bleeding was provided into the canal with the help of H file number 30 (Golden Star Medical, Shenzhen, China). (fig. 3) The bleeding was expected to reach the enamel-cement limit. Wet cotton pellets were placed in the pulp chamber and clot was waited to be organized for about 15 minutes, and then the clot was covered with MTA (Angelus MTA, Angelus, Brasil). Silane coupling agent (ESPE Sil, 3M ESPE, GER) was applied to the MTA and it was covered with composite resin. (fig. 4)

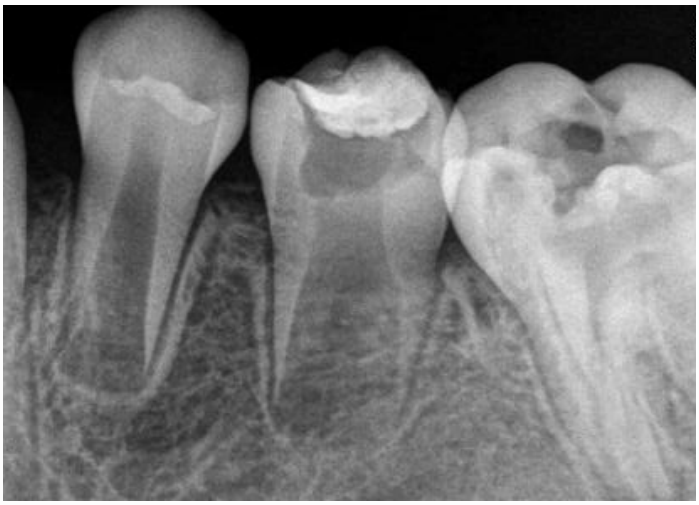

Fig.2. Temporary filling after 2% CHX application

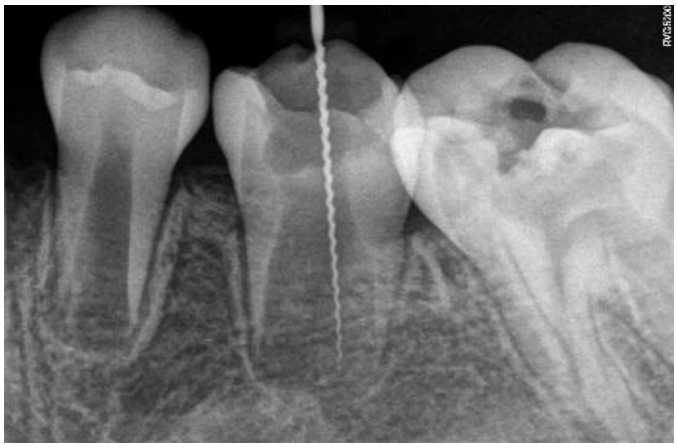

Fig.3. Forming a clot in the canal with the help of file

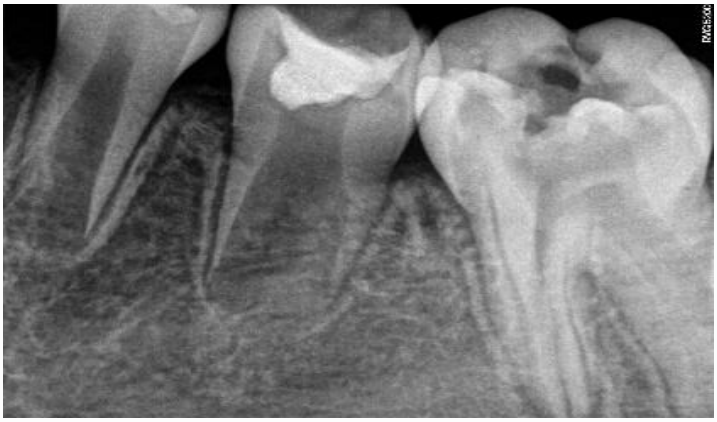

Fig.4. Final restoration

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The patient was followed up for 1 year at 3-month intervals. At the end of the first year, no clinical pathological findings were found in the patient. When examined radiographically, it is observed that root development continues, dentin production continues in the root canal, periapical pathology has completely healed and lamina dura continues. (fig. 5a,b)

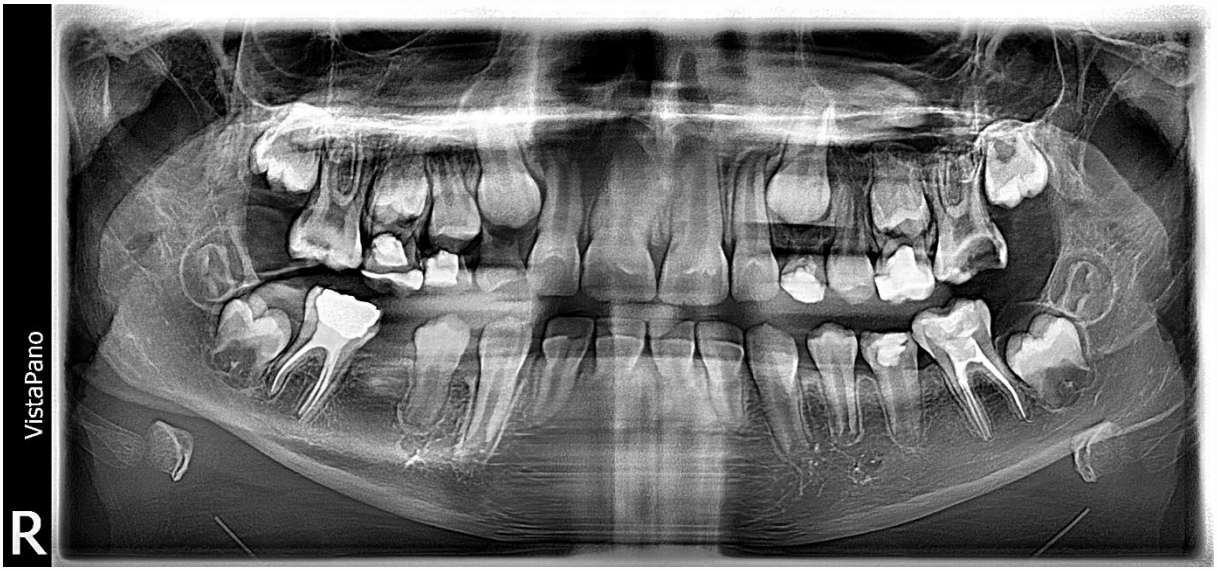

Fig.5a. Follow-up one year panoramic radiograph

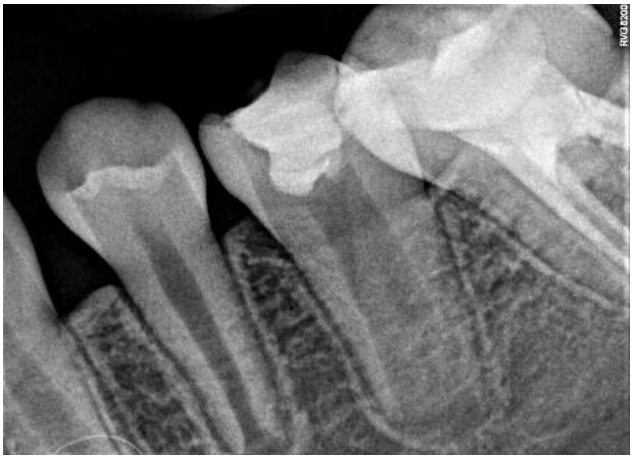

Fig.5b. Follow-up one year periapical radiograph

DISCUSSION:

Studies on the treatment of avulsed permanent teeth whose root apex is not completed, show that revascularization can occur in the root canal system (18,20). If an environment similar to environment that is occurred in the avulsed tooth can be created, so, if the canal can be effectively disinfected, a matrix can be created for new tissue regeneration and coronal sealing can be achieved, it is predicted that pulp tissue may regenerate (1,2,26). This application was preferred because it was considered that the application of silane coupling agent on the

MTA would increase the MTA-composite resin connection (27) and contribute to sealing.

$Ca(OH)_2$ can be used as an alternative to other intra-canal drugs due to antimicrobial properties (28,29), no coronal coloration (30), secretion of growth factors and biomolecules from dentin. (31) Nagata et al.(32) applied triple antibiotic pat to the

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upper incisors of 11 patients with open apex necrosis pulp and $Ca(OH)_2$ and 2% form of CHX to the upper incisor teeth of 11 patients with similar symptoms in their studies. As a result of their studies, they obtained similar clinical and radiographic findings in both applications, except for coronal coloration in the teeth used in triple antibiotic paste. In contrast, Andreasen et al. (10) reported that $Ca(OH)_2$ increases the risk of breaking the root due to its interaction with dentin. As a result of the studies of Bose et al. (33) and Banchs et al. (18), they recommend that $Ca(OH)_2$ is used only in the coronal half to avoid being affected to apical root cells due to high pH of $Ca(OH)_2$.

On the other hand, CHX can be preferred in revascularization treatments due to its antimicrobial effect and less toxic properties in contact with periapical tissues in immature teeth than other solutions (34.35). Therefore, 2% of chlorhexidine gel alone was preferred as an alternative to triple antibiotic paste.

Studies have shown that local application of a mixture of Ciprofloxacin, Metronidazole and Minocycline is effective against endodontic pathogens (21,22). In this case report, the use of chlorhexidine gel for revascularization is presented as an alternative. In this case, four weeks after the gel application of chlorhexidine, the tooth was observed asymptomatic. This case shows that the applied protocol can provide effective disinfection in the root canals.

CONCLUSION:

As a result, the use of 2% chlorhexidine gel during revascularization therapy is thought to be an appropriate alternative for immature necrotic teeth. At the same time various treatment methods were presented in case reports related to endodontic regeneration and studies analyzing overall results were limited. Therefore, more long-term follow-up clinical trials are needed to prepare a uniform treatment strategy.

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