

## A 15 year old male with continuous dull pain in the maxillary left central incisor

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### Article Info

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### Presentation of Case

*Dr. Mst. Mahbuba Kafia Parvin:* A 15 year old male patient came to the Department with the complaint of continuous dull pain on his upper left central incisor. He also gave a history of traumatic injury when he was eight years old for which he didn't undergo any dental treatment. He had noncontributory medical history. On extraoral examination, no abnormality was detected. Intraoral examination revealed there was no sign of caries, no crown discoloration, no swelling and no sinus tract was present. Gingival tissue and tooth were intact. On palpation, the patient felt mild pain on the root area of affected tooth. On percussion, dull percussion note was present. No mobility was found. On vitality test, there was no response to both cold and heat test. The periapical radiograph revealed a large periapical radiolucency with open apex.

*Dr. Md. Shamsul Alam:* The periapical radiograph showed that the maxillary left central incisor had an incompletely developed apex and a periradicular radiolucency (Figure 1). An apical diameter was more than 1 mm mesiodistally. Periodontal ligament and lamina dura were not intact.

### Treatment Procedure

*Dr. Kafia:* In 1st visit: With all aseptic precaution, local anesthetic was administered and access opening was performed. The working length was determined by placing a # 20k-file in the canal and taking a periapical radiograph. The canal was copiously and gently irrigated 2 mm shorter than the working length using 10 mL of 2.5% sodium hypochlorite for over 20 min and sterile normal saline without instrumentation. The canal was then dried with an appropriate sized sterile paper points. Lesion sterilization and tissue repair (LSTR) was placed into the root canal system 2 mm from the working length and left for 14 days. The paste was tamped down in the canal space

using the blunt end paper points. The access cavity was sealed with a cotton pellet and then placed composite resin restoration. The patient was advised to revisit after two weeks.

In 2nd visit: After two weeks, the tooth was asymptomatic. Local infiltration anesthesia was performed with 2% lignocaine without vasoconstrictor to facilitate the ability to trigger bleeding into the canal system. Composite resin restoration and cotton pellet were removed from the access cavity and the tooth was copiously and slowly irrigated with 2.5% sodium hypochlorite and together with sterile agitation with a small hand file to remove the antimicrobial medicament. Then normal saline was used. A 17% EDTA for 1 min was also used for a final rinse. The canal was dried with sterile paper points and checked for any exudates. There was no sign of inflammatory exudates. An endodontic 40k-file was introduced into the canal up to a few millimeter beyond the apical foramen. Irritation of the apical vital tissue was performed with gentle scraping and apical bleeding of root canal space was done. A cotton pellet was subsequently placed into the canal 3 mm below the cemento-enamel junction and remained in place for 15 min to ensure clot formation. The presence of the blood clot was confirmed visually (Figure 2). The blood clot acts as a suitable barrier for the placement of mineral trioxide aggregate. Approximately 4 mm thickness of mineral trioxide aggregate was placed over the blood clot below the cemento-enamel junction and a moist cotton pellet was placed in contact with mineral trioxide aggregate and a radiograph was taken (Figure 2). Access was sealed with composite resin restoration. The patient was advised to revisit after 24 hours.

Final visit: The composite resin restoration and cotton were removed. The hardness of mineral trioxide aggregate was checked with a condenser and double seal of coronal access with dentin bonding (glass ionomer) and composite resin restoration. A post-operative radiograph was taken. The patient was advised for follow-up.



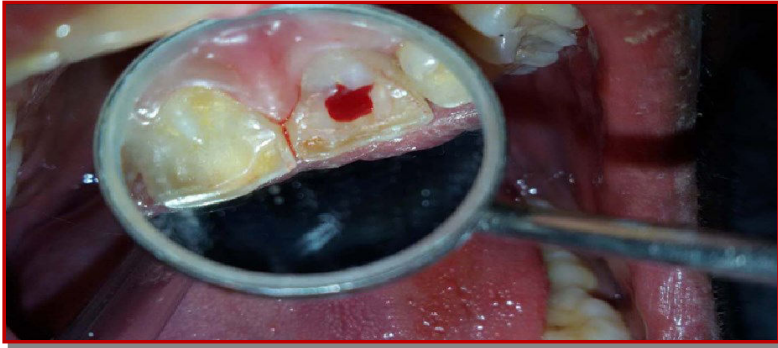


Figure 1: Clinical photograph of the bleeding tooth

### Provisional Diagnosis

Chronic apical periodontitis with open apex

### Differential Diagnosis

*Dr. Kafya:* Differential diagnosis may be pulpal necrosis or apical root resorption. All these are excluded by earlier attempted dental history, clinical and radiological examination. Development of root continues up to 3 to 4 years after eruption of

the tooth. During this period, if there is any dental trauma, it may cause injury to Hertwing's epithelial root sheaths and leads to cessation of further root development.

#### Pulpal necrosis

Pulpal necrosis as a consequence of untreated dental caries in young permanent teeth which often results in teeth with open apex, thin root walls and poor crown root ratio.<sup>1</sup> Clinically, there is caries and discoloration of the crown. On the other hand, if there is previous history of trauma, it is revealed, e.g., fracture of crown or intact crown. The careful interpretation of the clinical and radiographic signs can help the clinician to differentiate the diagnosis of open apex due to pulpal necrosis which is a sequel of caries or chronic periodontitis having a traumatic history.

#### Apical root resorption

Local factors that produce excessive pressure due to orthodontic treatment procedure or inflammation are the most frequent causes of resorption. In routine dental examination, resorption is often an incidental finding. Otherwise, in late stage, in most of the cases tooth mobility or infection may arise.<sup>2</sup>

### Discussion

*Dr. Kafya:* Pulp revascularization was considered to be treatment of choice in order to save the tooth and promote root development. The primary goal of regenerative endodontic procedure is healing of the apical periodontitis as stated in the revised AAE guidelines. According to the guidelines, the secondary goal is to increase the root wall thickness and root length. The tertiary goal is to regain a positive response to pulp testing. Both the secondary and tertiary goals are desirable but possibly not essential to determine the clinical success.<sup>3</sup>

Regenerative endodontics is a biological-based procedure for a permanent tooth with pulpal necrosis to re-establish a pulp dentin complex.<sup>4,9</sup> Extension of regenerative endodontic procedure to permanent teeth opens new perspectives and offers biological basis for such procedure recently.<sup>10-13</sup> Bleeding provocation into the canal causes mesenchymal stem cell influx which has a distinct differentiation capability into odontoblast like cells and forming root dentin.<sup>14-16</sup> Case selection is important for the success of regenerative endodontic. Radiographically more than 1 mm apical diameter (mesio-distally) is necessary. The procedure does not depend on periradicular radiolucency or negative vitality test.<sup>17-19</sup> The measure of treatment outcomes of revascularization are usually done by clinical and radiological findings which are finally confirmed by laser doppler flowmetry. There are some limitations of revascularization. Although blood clot having the

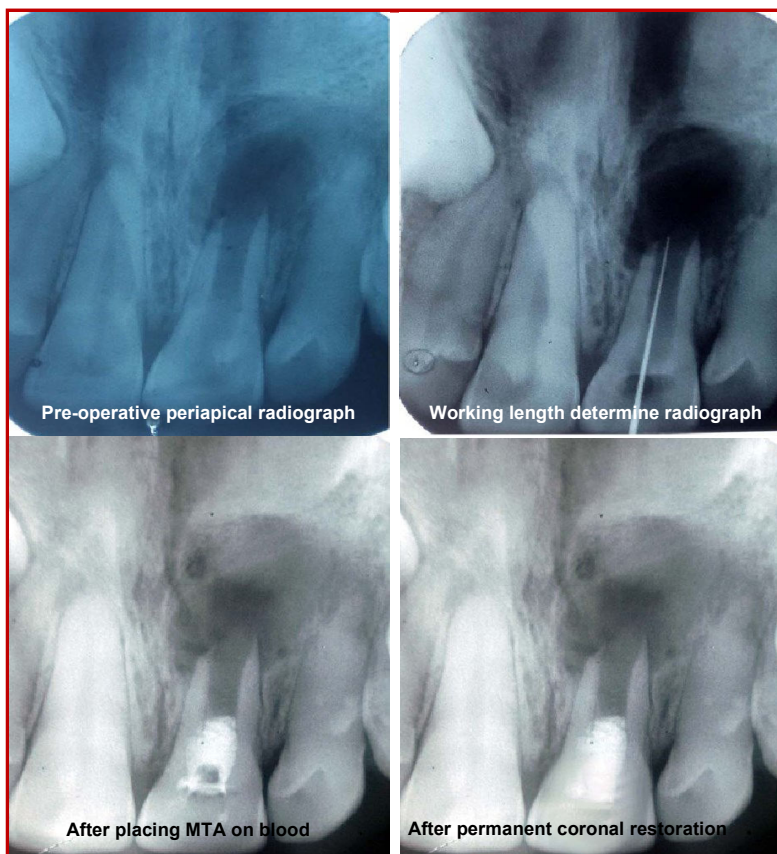


Figure 2: Radiographic photograph of the operated tooth

capacity to regenerate pulp tissue is exiting, but caution is required, because the source of the regenerated tissue has not been identified. Enlargement of the apical foramen is necessary. The regenerative endodontic treatment procedure have many disadvantages such as crown discoloration, development of resistant bacterial strain and allergic reaction to the intracanal medication. Sometimes canal may get calcified compromising esthetic and not allowing post-placement .

#### Discussion about irrigating solution

*Dr. Gokul:* The viability of stem cells from the apical papilla depends on the concentration of sodium hypochlorite, as used as irrigating solution. 0.5 to 3% sodium hypochlorite reduced viability to 60% whereas 6% sodium hypochlorite diminished the cell numbers bellow 20%. However, these toxic effects and cell viability are recovered by subsequent rinse with 17% EDTA.<sup>20</sup> In some cases, it is reported that the use of chlorhexidine diglucuronate after sodium hypochlorite was performed.<sup>21</sup> But in regenerative endodontic procedures, chlorexidine does not appear to be the best choice for an irrigating solution. The disadvantage of chlorexidine is its cytotoxic effects on stem cells from the apical papilla<sup>22</sup> and its interference with cell adhesion on the dentine surface.<sup>23</sup> On the other hand, EDTA exhibits another positive effect, namely the release of growth factors on the dentine surface.<sup>24</sup> Thus, irrigation with sodium hypochlorite up to 3% in generous amount and duration followed by EDTA appears feasible.

#### Discussion about triple antibiotics paste

*Dr. Mohammad Ali Asgor Moral:* The first steps of regenerative procedure is disinfection of the root canal system of the tooth. For this purpose, it is generally advocated the placement of a tri antibiotic paste, which is regarded as a mandatory requirement for success.<sup>25</sup> The triantibiotic paste consists of a combination of ciprofloxacin, metronidazole and minocycline in proportion of 1:1:1, which eliminate the intraradicular infection and promote release of growth factor and angiogenesis. Triantibiotic paste used because multiple aerobic and anerobic bacteria are present in root canal system whereas the respective drugs used alone have only substantially reduced but did not eliminate the bacteria.<sup>26</sup> The triantibiotic paste is also effective in eliminating bacteria in the deep layers of root canal dentine.<sup>27</sup> If the canal could not dry or exudate present, lesion sterilization and tissue repair dressing is repeated at one week interval until symptom free. Lesion sterilization and tissue repair-3 mix MP therapy is effective in root canal sterilization. However, pregnant women in third trimester and children under 8 years minocycline use is contraindicated. Minocycline also shows discoloration of the crown.<sup>28</sup> There are some cases reported on the

successful regenerative endodontic procedure utilizing a slight variation of the triantibiotic pasted that is clindamycin, amoxicillin, cefroxadine used instead of minocycline. But the patients who have known allergy to penicillin, use of amoxicillin is contraindicated.<sup>29</sup>

#### Discussion about bleeding from canal

*Dr. Md. Shamsul Alam:* The success of revascularization depends on the inclusion of blood clot in the root canal<sup>30</sup> and that the induction of bleeding into the canal may provide stem cells that can induce dentin formation.<sup>31</sup> Besides acting as a scaffold, the blood clot may also contain growth and differentiation factors that may be important for successful revascularization of the empty pulp canal. The failed regenerative procedures were attributed to the inability to evoke bleeding into the root canal.<sup>32</sup> It is important to consider that if bleeding after canal disinfection is not achieved, using an anesthetic without a vasoconstrictor when trying to induce bleeding because bleeding is easier when an anesthetic solution does not contain a vasoconstrictor. Mineral trioxide aggregate is carefully placed over the blood clot, followed by a wet cotton pellet. A coronal seal with mineral trioxide aggregate is used because the material possess an excellent sealing ability.

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#### Follow-up

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*Dr. Kafia:* The patient was recalled every three months for radiographic examination and evaluation of clinical signs and symptoms. In the follow-up sessions and after one year, the patient had no signs or symptoms. Sensitivity test showed no response to either cold or electric pulp test. Finally, no sign of discoloration was observed.

*Dr. Rubiya Hakim:* Why the apical foramen more than 1 mm is necessary in revascularization?

*Dr. Kafia:* To allow ingrowth of vital tissue, an open apex allows to the migration of mesenchymal stem cells in the root canal space.

*Dr. Shagupta Tabassum:* How does blood clot help revascularization?

*Dr. Kafia:* The blood clot acts as a matrix for the ingrowth of cells from Hertwig's epithelial root sheath into the pulp canal.

*Dr. Yesmin Ferdous:* If bleeding does not occur during treatment what can we do?

*Dr. Kafia:* We can take venous blood.

*Dr. Fida Hassan Talukder:* How does the lesion sterilization and tissue repair act?

*Dr. Kafia:* It acts by disinfection of the canal and

promotes release of growth factor and angiogenesis.

*Dr. Amina Khatun:* Why double seal of coronal access is done?

*Dr. Kafīa:* To avoid crown discoloration,<sup>33</sup> contact of triantibiotic paste with dentin and allergic reaction.

*Dr. Hasan Ali:* Why regenerative endodontics is not used to deciduous teeth?

*Dr. Kafīa:* Because of the possible risk of impairing the eruption pattern of permanent teeth.<sup>34</sup>

*Dr. Mofazzal Hossain:* How many visits are required for treatment completion?

*Dr. Kafīa:* This treatment procedure generally comprises either two visit or one visit. However in case of pulp necrosis and periapical lesions, single visit approach may not be recommended.<sup>35-37</sup>

*Dr. Hamida Khatun:* Why revascularization is not possible with calcium hydroxide?

*Dr. Kafīa:* It causes necrosis of the tissue.<sup>38</sup>

*Dr. Moral:* Regenerative endodontics is going to bring a new era in clinical endodontics. It really have biological benefit and promotes the completion of root formation through the deposition of hard tissue with root lengthening and by reducing the risk of root fracture than traditional treatment procedure. Randomized, prospective clinical trials should be done to see the clinical outcomes.

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## Final Diagnosis

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Chronic apical periodontitis with open apex

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