

# Comprehensive Treatment of Immature Necrotic Permanent Teeth: A Case Report

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## **Comprehensive Treatment of Immature Necrotic Permanent Teeth: A Case Report**

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## ABSTRACT

**Background:** Immature necrotic permanent teeth are frequently found in anterior teeth caused by traumatic dental injuries. To have satisfying treatment results, apical closure, root wall thickness and dimensions, and teeth discoloration must be considered. Therefore holistic treatment planning would make a difference in long-term achievement. The study showed two cases of immature necrotic permanent teeth treated by different holistic approaches.

**Case reports:** Case 1: A 16-year-old male presented with anterior tooth discoloration due to falling from a slide in elementary school. The tooth had been treated before. Clinical examination showed discoloration and fracture on the middle third of the left maxillary central incisor with a horizontal line, while radiographic examination showed open apex and periapical radiolucency on the tooth. Previously initiated therapy was diagnosed for the case. Case 2: A 30-year-old female presented with anterior teeth discoloration due to stumbled from stairs more than 15 years ago. Clinical examination showed discoloration and fracture on the incisal of the two maxillary central incisors. Open apex and periapical radiolucency was found in radiographic examination. Asymptomatic apical periodontitis *et causa* pulp necrosis was diagnosed for the case.

**Case Management:** The treatment plan consists of root canal treatment with mineral trioxide aggregate (MTA) as an apical plug, followed by intracoronary bleaching. Case 1 was restored by fiber post and lithium disilicate crown, while case 2 was restored using composite resin as direct restoration.

**Conclusion:** The holistic treatment of immature necrotic permanent teeth following the case will restore the teeth's functions and give satisfying results.

Keywords: immature necrotic permanent teeth, apical plug, holistic treatment, mineral trioxide aggregate

## BACKGROUND

According to a meta-analysis review, traumatic dental injuries prevalence to permanent teeth was 14.8%, prevalence among 12-year-old children was 14.3%, and the male-to-female prevalence ratio was 1.41. Other research studied the pre-school children. The uncomplicated crown fracture was the most common type involving anterior teeth.<sup>1,2</sup> Another study showed that delayed handling of traumatic dental injuries affects complications such as pulp necrosis.<sup>3</sup>

Pulp necrosis on immature permanent teeth leads to the arrest of root formation, thin root dentinal walls, and open apices.<sup>4</sup> The consequences make endodontic treatment even more challenging because of the possibility of root fractures in the coming days. Science improvement has developed a regenerative endodontic therapy expected to induce apexogenesis and add root dentinal wall thickness. Unfortunately, until now, the result is still unpredictable. Moreover, the treatment has a limitation of success according to residual bacteria and showed space lack, making intracanal post placement impossible to apply.<sup>5</sup> Due to the circumstances, conventional treatment using mineral trioxide aggregate (MTA) as an apical plug, still becomes an option to overcome the pulp necrosis on immature permanent teeth.

## CASE REPORTS

### Case 1:

A 16-year-old male came to RSGM FKG Universitas Trisakti, Jakarta, with discoloration on his anterior tooth. He fell off the slide in elementary school, and the tooth had unfinished treatment from the previous dentist because of the patient's time limitation.

Clinical examination of the maxillary left central incisor showed discoloration, a temporary filling, and a fracture on the middle third of the incisal. The fracture went on a horizontal line. The percussion test was positive, while the radiograph showed a wide root canal, open apex, and periapical radiolucency on tooth #21 (Fig. 1A-C). Overjet and overbite measurements resulted in 1 mm and 1 mm, respectively. The fracture was classified as a complicated crown fracture, and the case was diagnosed as previously initiated therapy.

**Case 2:**

A 30-year-old female came to RSGM FKG Universitas Trisakti, Jakarta, with discoloration on her anterior teeth. She stumbled from stairs more than 15 years ago and did not seek treatment until then. Clinical examination of two maxillary central incisors showed discoloration and fracture on the incisal. The fracture of tooth #21 went on oblique line. The percussion test was positive, while the radiograph showed a wide root canal, open apex, and periapical radiolucency on teeth #11 and #21 (Fig. 2A-C). Overjet and overbite measurements resulted in 5 mm and 2 mm, respectively. The fracture was classified as an uncomplicated crown fracture, and the case was diagnosed as asymptomatic apical periodontitis *et causa* pulp necrosis.

**Managements:**

The treatment plan for both cases was made after a thorough examination, including subjective, objective, and radiographic studies. In both cases, the treatment was initiated by cleaning the canals using circumferential filing, continuous 0.5% sodium hypochlorite irrigation, and calcium hydroxide (Ultracal; Ultradent, South Jordan, Utah, USA) as an intracanal medicament for ten days. Apical plug using MTA (Cerkamed; ) was applied on the

second visit, followed by backfill obturation (Elements obturation unit; SybronEndo, Kerr Corporation, USA) and internal bleaching (Opalescence Endo 35%; Ultradent, South Jordan, Utah, USA) for color correction. The operator used a rubber dam to isolate the working area in all sequences. The treatment sequences of case 1 showed in Fig 3A-E and case 2 showed in Fig 4A-I.

In Case 1, fiber reinforced composite post (TENAX-Coltene, Coltene Holding, Swiss) with resin cement (Maxcem Elite; Kerr Corporation, USA) was applied to add retention. The procedures followed by crown preparation, imprint, and record bite registration. The operator planned to make a disilicate lithium crown. Inter visits, a temporary crown was used to protect the remaining tooth. On the subsequent treatment, the operator performed the subjective and objective examination, released the temporary crown using a tracker, and trialed the crown. After achieving the marginal integrity of restoration and occlusion, the crown was cemented using resin cement (Maxcem Elite; Kerr Corporation, USA). The radiograph taken one month after treatment showed healing of the periapical lesion, and the patient was satisfied with the result (Fig 5A-F).

In Case 2, after color selection using the button technique, etching gel (Ultradent-etch, Ultradent, South Jordan, Utah, USA) was applied for 15 seconds, followed by unfilled resin (Scotchbond Universal Adhesive; 3M, USA) and polymerization. The maxillary central incisors were restored by packable composite resin (G-aenial; GC Corp., Tokyo, Japan). One month after treatment, the patient was recalled and re-examined. There was no subjective or objective complaint. A radiograph was taken, and it showed healing of the periapical lesion (Fig 6A-D).

## DISCUSSION

The case reports showed apexification treatment using MTA on immature permanent teeth with pulp necrosis. The decision was made based on the success rate of apexification using MTA and various results of the alternative treatment, that is regenerative endodontic therapy.<sup>6,7</sup> The latest systematic review also affirmed that regenerative endodontic treatment and apexification have similar outcomes, although MTA has more benefits than calcium hydroxide in inducing calcific barriers. This is due to the time of treatment reduction.<sup>8,9</sup>

Sodium hypochlorite was a standard protocol irrigation with concentration range between 0.5% to 6%. In this case reports, 0.5% concentration were used to prevent toxicity on periapical tissue. It is in accordance with similar case that reported previously.<sup>10</sup> Another research showed that there are no significance difference of success rate in using high concentration and low concentration sodium hypochlorite in 12 month observation.<sup>11</sup>

Regarding restoring the teeth function, there are differences in deciding the final restoration in case 1 and 2. Case 1 was restored using an intracanal fiber post and disilicate lithium crown. The reasoning behind the decision was extensive hard tissue loss and this is in line with other previous studies.<sup>12,13</sup> While case 2 showed minimal loss of hard tissue, and the final restoration was in line with similar issues.<sup>14,15</sup> According to an earlier study, the use of reinforced material in root canals after apexification had a similar fracture rate to the group with nonreinforced materials. Further explanation was that reinforced material was not a requirement if the teeth have minimally 1 mm cervical dentin thickness. The intracanal

barrier used in the cases also provides fracture resistance to the cervical part of immature necrotic teeth.<sup>16</sup>

### **CONCLUSION(s)**

The holistic treatment applied in each cases can bring back the teeth's function and gives satisfying result to the patient. Consideration of cases make difference in determination suitable final restoration.

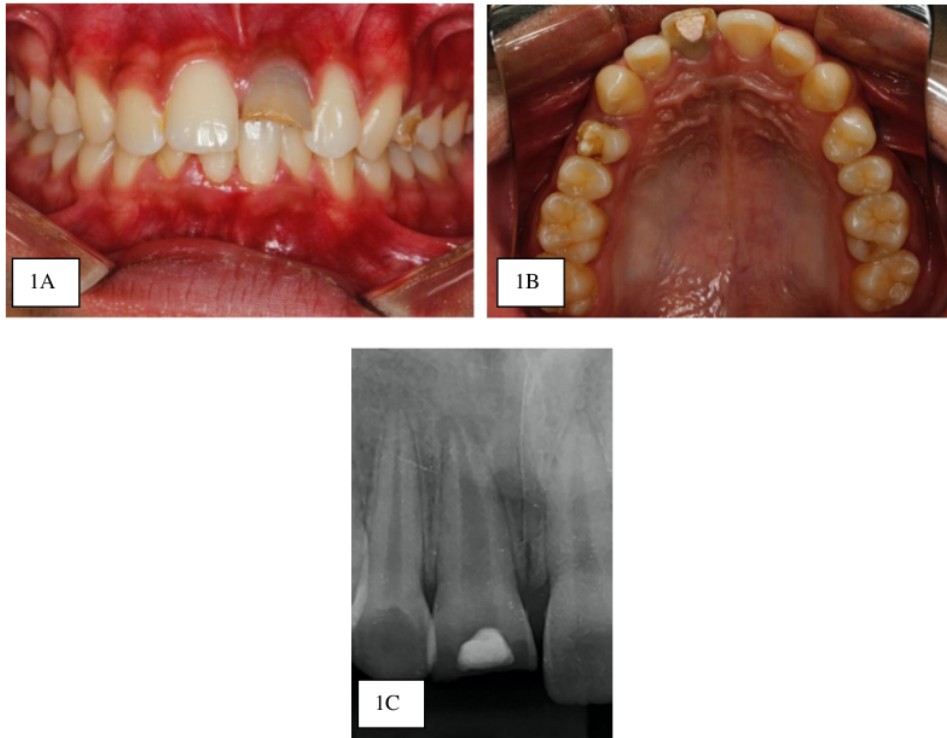


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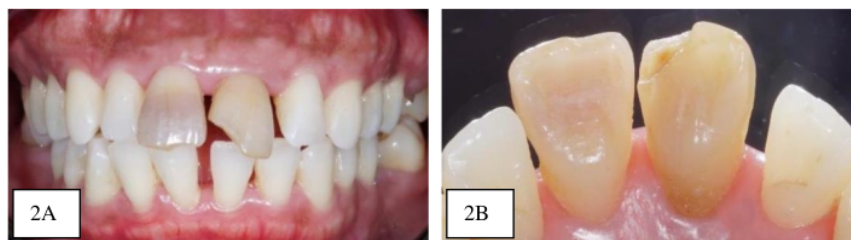
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## FIGURES

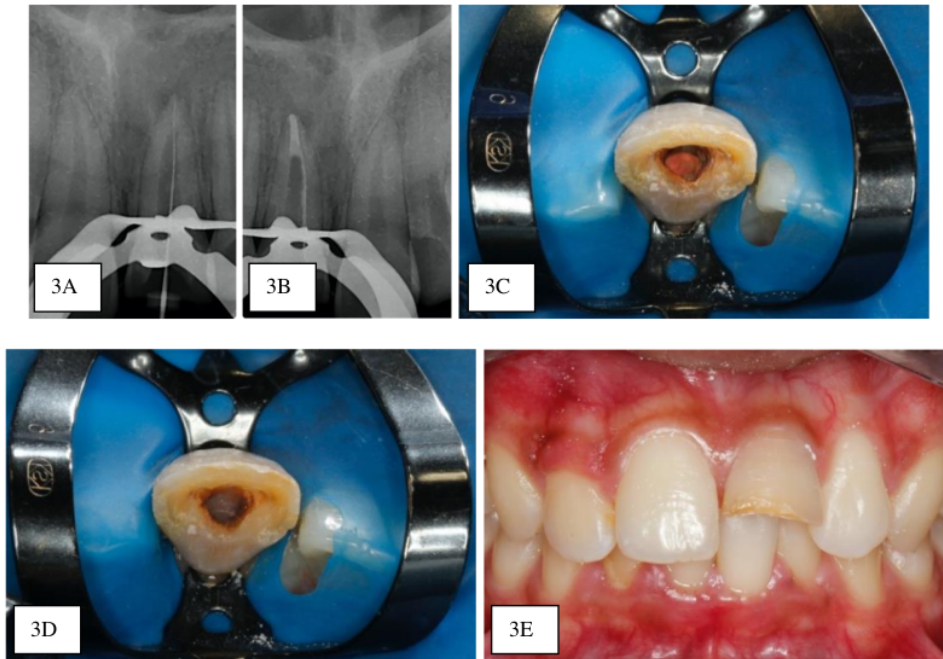


**Figure 1.** Clinical photograph and radiograph of maxillary left central incisor in case 1. A.Labial angle photograph showed discoloration and a horizontal fracture line on middle third. B. Palatal angle photograph showed fracture line and temporary filling. C.Radiographic examination showed open apex, wide root canal and periapical radiolucency.





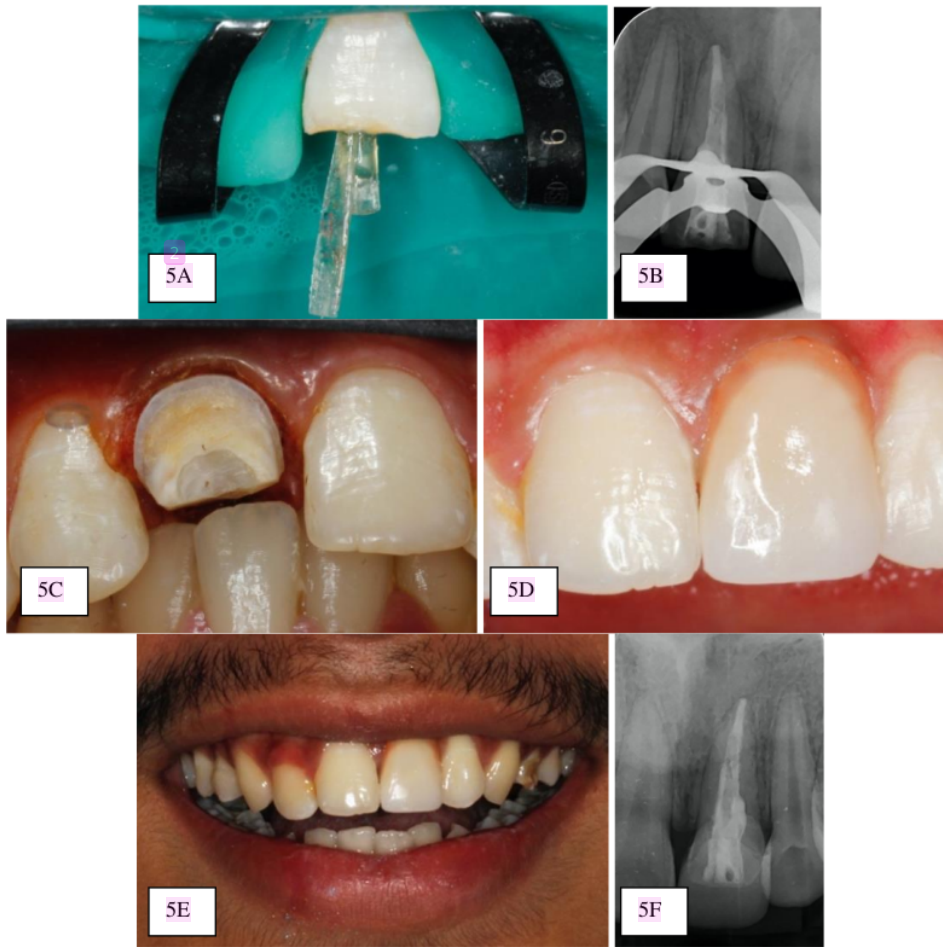
**Figure 2.** Clinical photograph and radiograph of maxillary central incisors in case 2. A. Labial angle photograph showed discoloration and fracture on incisal. B. Palatal angle photograph showed fracture line involved enamel and dentin. C. Radiographic examination showed open apex, wide root canal and periapical radiolucency on both teeth.



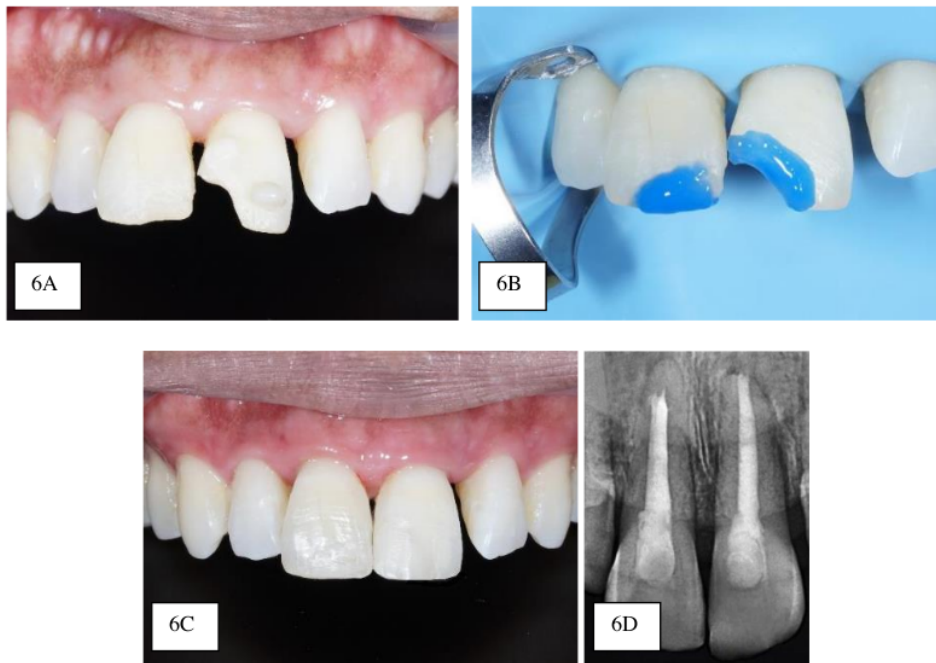
**Figure 3.** Treatment sequences of tooth #21 in case 1. A. Working length confirmation using radiograph. B. Radiograph confirmation of mineral trioxide aggregate placement. C. Obturation of the root canal. D. Wing barrier using glass ionomer cement before intracoronal bleaching. E. After intracoronal bleaching.



**Figure 4.** Treatment sequences of teeth #11 and #21 in case 2. A. The fracture lines of tooth #11 and #21 were beveled. B. The tooth #11 and #21 were restored by composite resin. C. Opening access cavity of #11 and #21. D. Working length confirmation of tooth #11 (22 mm) and #21 (21mm). E. Root canal medicament on #11 and #21 confirmation. F. Apical plug followed by obturation of the root canals. G. Wing barrier confirmation before internal bleaching. H. Shade examination before internal bleaching. I. Shade examination after internal bleaching.



**Figure 5.** Final restoration sequences of teeth #21 in case 1. A. Cementation of fiber post using resin cement. B. Radiograph confirmation of post placement. C. Crown preparation, followed by imprint and record bite registration. D. Cementation of the crown on the next visit. E. One month recall showed the restoration was still in good condition. F. Radiograph confirmation one month after the treatment showed healing of the periapical tissue.



**Figure 6.** Final restoration sequences of teeth #11 and #21 in case 2. A. Shade selection using button technique on incisal third and cervical. B. Etching gel was applied. C. After direct restoration using composite resin D. Radiograph confirmation one month after the treatment.

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