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內文：

#### Abstract

1. This case report describes the management of a late-referral case of periapically involved, traumatized immature permanent incisors by endodontic treatment and the use of mineral trioxide aggregate (MTA) apical plugs.
2. A 10-year-old boy was referred to the clinic with a chief complaint of pain in his maxillary central incisors, which had experienced subluxation trauma 2 years earlier.
3. Periapical radiograph of the teeth showed incomplete root development with wide-open apices and large periradicular lesions.
4. The canals were gently debrided using K-files in conjunction with 2.5% NaOCl irrigation and 2% chlorhexidine for final flush.
5. The root canals became asymptomatic after employing the same endodontic regimen for three visits.
6. MTA plugs were placed in the apical area of the root canals, and the rest of the canal space was obturated by warm compaction of gutta-percha and AH Plus sealer.
7. Resolution of the large periapical lesions was observed 2 months after treatment.
8. At 18 months, the periapical areas revealed radiographic evidence of bone healing.

#### Introduction

1. The majority of injuries to young permanent teeth occurs before root formation is complete and may result in pulpal inflammation or necrosis
2. Management of pulpal complications at this time is a significant challenge, because of the thin dentin walls and the wide-open apex
3. Apexification has proven to be highly predictable, but has the disadvantages of multiple visits during a relatively long period of time and an increased susceptibility to cervical fracture.
4. Reinfection may also manifest in the long term
5. Artificial apical barriers with a variety of materials have been suggested as an alternative to traditional calcium hydroxide apexification
6. The popularity of mineral trioxide aggregate (MTA) can be attributed to several factors including biocompatibility and good sealing properties.
7. The main components of MTA include tricalcium silicate, tricalcium aluminate, tricalcium oxide, and silicate oxide
8. The present report describes the management of a late-referral case of traumatized immature permanent incisors with large periradicular lesions by endodontic treatment and the use of MTA apical plugs.

#### Case report

1. A healthy, 10-year-old boy was admitted to the pediatric dentistry clinic with a chief complaint of pain in his upper incisors.
2. Reportedly, the child had experienced an injury of the front teeth because of a fall

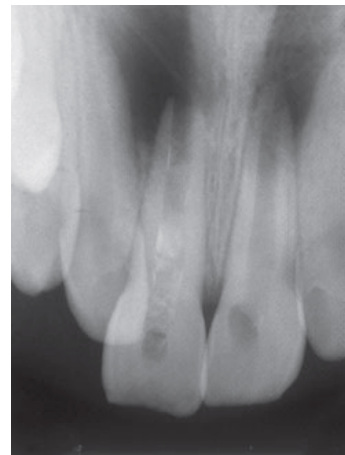
accident at the age of 8.

3. The parents recalled the dentist explaining

- ✓ subluxation injury
- ✓ a splint was not placed on the affected teeth
- ✓ two months later, the dentist initiated endodontic therapy of the incisors, but the patient refused to attend further treatment

4. Clinical examination

- ✓ uncomplicated crown fracture of the right central incisor
- ✓ temporized endodontic access cavities on both teeth
- ✓ slightly tender to percussion
- ✓ moderate mobility
- ✓ Both teeth were non-responsive to electronic pulp testing and thermal tests



5. Radiographic findings

- ✓ incomplete root development with
- ✓ wide-open apices
- ✓ large periapical lesions
- ✓ right central incisor : suggestive of remnants of calcium hydroxide dressing

6. Diagnosis : chronic apical periodontitis

7. Treatment plan : endodontic treatment involving  
MTA apical plugs

8. Treatment course :

- ✓ local anesthesia
- ✓ rubber dam was placed
- ✓ gently removed the necrotic tissue and remnants of what was regarded as calcium hydroxide by # 80 K-file at a working length 1 mm short of the radiographic apex.
- ✓ Slight drainage of pus was observed during debridement and copious irrigation with 2.5% sodium hypochlorite (NaOCl)
- ✓ A final irrigation was made with 2% chlorhexidine and sterile saline.
- ✓ The root canals were dried, and the temporary fillings were placed.



9. No attempt to further enlarge the root canals

10. A calcium hydroxide dressing was not placed so as to discard further risk of tooth fracture.

11. The patient was scheduled for three consecutive weekly visits after which implementation of the same debridement and irrigation regimen lead to cessation of pus drainage and the absence of symptoms.

12. MTA was prepared according to the manufacturer's instructions, and a small portion of the material was deposited 1 mm below the working length using ProRoot MTA delivery gun.

13. MTA plugs were placed to the apex with a minimum 4-mm thickness

14. Correct placement of the MTA plugs was verified with a periapical radiograph, which showed minimal extrusion of



MTA into the periapical lesion of the right central incisor

15. temporary filling

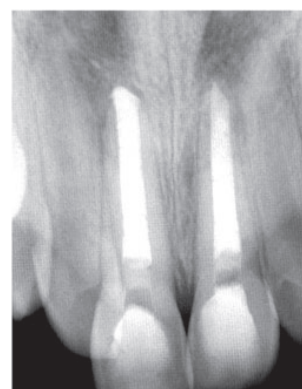
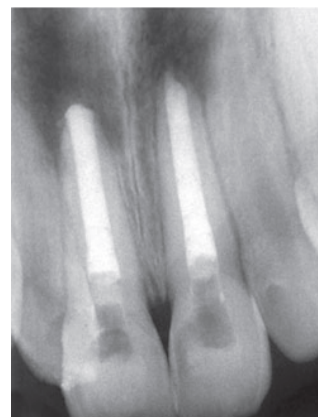
16. One week later, the setting of the MTA was confirmed with a hand plugger.

17. Warm compaction of gutta-percha with AH Plus sealer. Hybrid resin composite, bonded with an etch-and-rinse adhesive

18. The radiographic follow up at 18 months showed advanced healing of the periapical radiolucency and regeneration of the periradicular tissue.

#### Discussion

1. Subluxation injuries seldom result in pulp necrosis in immature teeth. A crown fracture coupled with a luxation injury can significantly increase the likelihood of pulp necrosis.
2. The rare but not impossible occurrence of pulp necrosis in subluxated immature teeth should not be overlooked.
3. To avoid an infection process.
  - ✓ precise diagnosis of the trauma lesion
  - ✓ the knowledge of its prognostics
  - ✓ the consequent follow up
4. Management of dental injuries may be neglected or lately referred by parents, because of the child's inability to cope with treatment
5. Andreasen et al. calculated a reduction of as great as 50% in the fracture strength of mature roots subjected to 1-year application of intracanal calcium hydroxide
6. Accordingly, the endodontic treatment plan did not include placement of intracanal calcium hydroxide for elimination of the root canal flora, despite the apparent need for more endodontic visits to obtain the goal.
7. No special obturation technique was utilized to reinforce the roots because the extent of reinforcement provided by current endodontic obturation systems is known to be far less effective than the actual levels of adhesion necessary to prevent root fractures
8. Use of MTA apical barriers
  - ✓ Making it possible to restore the teeth without adversely affecting the mechanical properties of root dentin.
  - ✓ The production of bone morphogenetic protein-2 (BMP-2) and transforming growth factor beta-1 (TGF  $\beta$ -1) could be two important contributors to the favorable biologic response stimulated by MTA in human periapical tissues.
  - ✓ It has also been shown that the stimulation of interleukin production by MTA may allow for the overgrowth of cementum and facilitate the regeneration of the periodontal ligament and formation of bone.
9. In the present case
  - ✓ Advanced osseous healing of the periapical lesions was evident even 6 months after placement of the MTA apical plugs.
  - ✓ The periapical healing of the upper right incisor was not affected by the extrusion of MTA beyond the root end.
  - ✓ This finding corroborates with those of previous animal and human studies demonstrating that the contact of extruded MTA with the periapical tissue does not elicit a host response and thus is not an obstacle to healing.



10. it can be concluded that MTA plugs offer the advantage of high predictability of apical closure, along with shorter treatment time and less dependence on patient compliance.

題號	題目
1	Which state about MTA and calcium hydroxide is false (A) MTA produced significant more dentin bridging (B) Calcium hydroxide caused less inflammation (C) MTA is better in biocapacity (D) Dentin deposition began earlier with MTA
答案(B)	出處：Pathways of the PULP eight edition p.810
題號	題目
2	Initial Vitality testing of traumatized teeth is most useful to which of the following? (A) It establishes a baseline for comparison with future testing (B) It determines whether root canal treatment is indicated (C) It determines if the blood supply to the pulp is compromised (D) It predicts the pronosis
答案(A)	出處：Pathways of the PULP eight edition p.993