

## Endodontic management of traumatized immature nonvital permanent anterior teeth: A case report

Pradhan RJ

Lecturer, Dental Department, KIST Medical College & Hospital, Imadol, Lalitpur

### Abstract

Patients who present with non-vital immature permanent teeth pose a special challenge to dentists and require a specially tailored treatment plan. Wide tubular canals usually seen in young permanent anterior teeth often affected by trauma pose an endodontic situation where achieving apical seal is difficult because of the wide apical foramen with a nonconstrictive terminus.

This case report presents the clinical procedure used to produce a hard tissue barrier in the open apex, and into which gutta percha along with the sealer was condensed by a special custom made technique.

**Key words:** Open apex, Calcium hydroxide, Apexification, Custom made obturation technique

### Introduction

Teeth with incomplete rhizogenesis, pose a special challenge to dentists all over because of large open apices, divergent root walls, thin dentinal walls that are susceptible to fracture and frequent periapical lesions. This group requires a specially tailored treatment plan, different from the other patients<sup>1</sup>.

Widely accepted endodontic management of these teeth requires cleaning and filing of the canal with temporary paste to induce a complete calcific barrier at the apex of the tooth for a root end closure of incompletely developed apex. Apexification is the term to describe this procedure. Finally different special techniques of obturation are used against which a guttapercha root filling can be condensed without the possibility of sealant or gutta-percha root filling going through the apex into the periapical tissues<sup>2</sup>.

Many materials have been reported to successfully stimulate apexification. But calcium hydroxide has its histological importance<sup>3</sup>. This medicament has also been shown to change the environment in the dentin and bone to a more alkaline pH, which has been postulated to slow down the action of the resorptive cells and promote hard tissue formation and repair<sup>4</sup>.

The calcified material that forms over the apical foramen has been histologically identified as an osteoid or cementoid. Radiographic interpretation of apical closure is often misleading<sup>3</sup>. It may need clinical determination.

Obturation of an immature tooth that has undergone apexification is difficult as the apical portion of the canal is often larger than the coronal portion and since the cross-section of the canal is much wider in the labio-lingual (or labiopalatal) direction than mesio distally<sup>2</sup>.

Guttapercha is obviously the filling material of choice because it can be packed into the irregularities that are present in these large canals.

Lateral compaction is not the technique of choice because the resistance of the canal walls for lateral pressure is reduced in immature teeth and the greater bulk of gutta-percha require an even greater force to deform. Warm guttapercha techniques are best suited for filling immature canals and apices. The method to be employed will depend upon the operators preference and expertise.

### Correspondence

Dr. Reema Joshi Pradhan, Lecturer (Conservative Dentistry & Endodontics), KIST Medical College & Hospital, Imadol, Lalitpur  
E-mail: Joshi\_reema@hotmail.com

## Case Report

A 10 years old boy came to the Dental Department, KIST Medical Collge, Imadol, for the treatment of the traumatized maxillary central incisors (Fig 1). The patient reported that the trauma occurred 6 months back and that no treatment had been performed. There was pain associated with both the fractured upper anterior teeth. Clinical examination revealed crown fractures exposing the pulp chamber of both maxillary central incisors.

The tooth failed to respond to cold test with ice stick and heat test using gutta percha cone. There was mild pain on percussion as well. There was absence of any sinus tract. Periapical radiographs revealed immature teeth with open apex (Fig 2).

In first visit, access was opened using a no. 4 round bur and coronal preparation was done by Gates Glidden bur. Initial working length was predicted by gently advancing a number 30 absorbent paper point along the root canal until it was pressed against tissue at the apex and the length was calculated by deducting the length soaked with blood. Then the working length radiograph was made (Fig 3) and working length was established at 1 mm short of the radiographic apex. Irrigation with 1% sodium hypochlorite was done throughout the cleaning and shaping procedures.

Gentle instrumentation was done with H-file from 60 to 120 no. in rasping movement. Canals were dried with larger number of sterile absorbent paper points. A slurry of radiopaque calcium hydroxide paste (Endocalpaste, Insta Chemical Ltd.) was placed in the canal with a lentulo spiral up to the full working length so that the paste contacted the tissue at the apex. Temporary restoration was given with reinforced zinc oxide-eugenol cement (Fig 4). One week later, a dressing of calcium hydroxide paste was again placed.

One month later a radiograph of the teeth were made. The canal were then dried and checked with 30 size paper point for apical barrier formation. The barrier formation was incomplete which was confirmed due to the presence of sensitivity in the apical area and also with the presence of blood and tissue fluid on the tip of the paper point.

On the visit after 2 months, the same procedure was repeated. Radiological examination showed initiation of apical barrier formation with the reduced diameter of the apical foramen (Fig 5). The root canal dressings were renewed in each visit.

In the next visit which was in 3 months interval, another radiograph was made and formation of apical barrier was checked. On insertion of no. 30 paper point, resistance was felt at the barrier region. The paper point was totally dry and the tip was also frayed (Fig 6). This indicated that the barrier formation was complete.

The final canal preparation was up to 130 no. file. Obturation was done in both the teeth using customized gutta percha technique. 2-3 standard sized gutta percha were selected (Fig 7). The cones were then softened with minimal amount of heat and were rolled in a glass slab with spatula until it formed a single smooth thick cone about the size of the canals (Fig 8 & 9). Resin based sealer (AH plus, Dentsply) was mixed and coated on to the manually modified guttapercha which was inserted up to the working length. Filling was done with glass ionomer cement (Fuji IX, GC corp). Radiograph was made (Fig 10).

One week later, little bit of the gutta percha was removed from the pulp chamber, and final restoration comprising of a glass ionomer lining and composite filling was placed. Follow up visits were done at 6 months interval.



**Fig 1:** Fractured maxillary central incisors



**Fig 2:** Pre-treatment radiograph



**Fig 3:** Working length radiograph



**Fig 4:** Radiograph after placement of Calcium hydroxide



**Fig 5:** Radiograph showing reduced diameter of root apex



**Fig 6:** Frayed end of paper point after barrier formation



**Fig 7, 8 & 9:** Preparation of customized gutta percha cone



**Fig 10:** Radiograph of root canals after obturation with customized gutta percha cones

## Discussion

The endodontic management of traumatized nonvital immature permanent anterior teeth has been reviewed. Some traditional treatment options have stood the test of time and are still valid to this day. Others have been reviewed and modified with the passage of time, as new science and new materials evolve to prove, disprove or facilitate approaches to the management of these cases. Practitioners need to always be aware of changes that occur from time to time with respect to the recommendations for treatment, and of scientific studies that support or disprove treatment rationales<sup>1</sup>.

Apexification is aimed at the formation of a mineralized barrier in the root apex in such a way that gutta-percha can be condensed properly in the main canal space<sup>2</sup>. Induction of apical closure has been the most widely used approach to treating open apices<sup>3</sup>.

Calcium hydroxide has been extensively used to accomplish apical closure due to its apparent ability to stimulate hard tissue formation<sup>5</sup>. It was originally introduced to the field of endodontics by Herman in 1930 as a pulp-capping agent, but its uses today are widespread in endodontic therapy<sup>6</sup>. Then, Kaiser first introduced the use of calcium hydroxide mixed with camphorated monopara-chlorophenol (CMCP) to induce apical closure. The technique was popularized later in 1966 by Frank<sup>7</sup>.

Calcium hydroxide can be mixed with a number of different substances (CMCP, distilled water, sterile saline, anesthetic solutions and recently chlorhexidine) to induce apical closure. The relatively good success rate of this procedure has been attributed to one or more of the following properties: (a) the high pH; (b) the calcium ion; (c) the hydroxyl ion; and (d) the antibacterial effect<sup>2</sup>.

Various other materials such as tricalcium phosphate, collagen calcium phosphate, osteogenic protein-1, bone

growth factors and MTA (Mineral Trioxide Aggregates) have been reported to promote apexification similar to that found with calciumhydroxide<sup>7</sup>.

Although apexification occurs with many materials, it has been reported even without the presence of canal-filling material after removal of the necrotic pulp tissue. The most important factors in achieving apexification seem to be thorough debridement of the root canal and sealing of the tooth<sup>4</sup>.

Apical barrier formation can be expected to occur in over 90% of teeth treated by this clinical technique. The average length of time to achieve an apical hard tissue barrier is 5-7 months, necessitating 2-4 visits and clinical technique which has been shown to be successful in 96% of teeth treated with a 5-year survival rate of 86%.<sup>8</sup> Failures are usually due to poor root canal therapy, inadequate coronal seal or further trauma of a tooth with an adequate root canal treatment<sup>2</sup>.

During the course of treatment by multiple visit apexification, it showed many teeth were lost while waiting for a calcific bridge to develop. In 1999 the revolutionary MTA material was advocated for cases with open apices as an apical barrier against which gutta-percha was condensed, compacted or even injected<sup>6</sup>.

A one-step alternative to conventional apexification procedures has been proposed by Koeings<sup>7</sup>. Successful performance of a one-step procedure may benefit both the patient and the practitioner because of the reduced amount of office time required. The potential problem of patient compliance is also reduced, and it appears that reopening the root canal and recleaning during multiple visits may disturb the process of apexification<sup>7</sup>.

The aim of the root filling is to completely obturate the root canal. Instead of the lateral condensation of gutta-percha points in cases of wide canals, other methods of filling

the root canal with guttapercha may be employed, these include constructing a custom guttapercha point or use of one of the heated guttapercha techniques<sup>3</sup>. The method to be employed will depend upon the operator's preference and expertise.

### Conclusion

Accidents at home, school or playground due to common childhood activities can result in traumatic injuries to the teeth. Upper anterior permanent central incisors are the teeth most frequently traumatized. The comprehensive management of these cases can increase the better outcome of treatment.

An immature tooth that develops pulpal or periapical disease presents special problems. Conventional root canal treatment or any surgical approach would be unpredictable. Apexification has been widely accepted procedure for such cases and calcium hydroxide plays a great role as an intracanal medicament for inducing apical closure by formation of an apical stop<sup>8</sup>. Though, time consuming, apical closure can be expected to occur in over 90 per cent of non vital immature incisor teeth treated by intracanal dressings of calcium hydroxide paste. The five year success rate is over 85 per cent for teeth with adequate root fillings<sup>2</sup>.

For wide canals and divergent apical portions, customized guttapercha cone technique is a simple procedure for obturation, which adapts easily on walls without voids<sup>8</sup>. A thorough clinical knowledge, accurate diagnostic techniques and meticulous endodontic procedures with

regular follow up leads to optimal outcome in such types of cases.

### References

1. Moule AJ, Moule CA. The endodontic management of traumatized permanent anterior teeth: A review. *Aust Dent J* 2007;52:(1 Suppl):S122-37.
2. National Clinical Guidelines and Policy Documents 1999 -management and root canal treatment of non-vital immature permanent incisor teeth, Dental Practice Board for England and Wales. [www.nhsbsa.nhs.uk/Documents/.../paediatric\\_dentistry\\_uk,1999](http://www.nhsbsa.nhs.uk/Documents/.../paediatric_dentistry_uk,1999) (downloaded on 21 October 2009)
3. Cohen S, Hargreaves KM. *Pathways of the Pulp*, 9<sup>th</sup> ed, Mosby Elsevier; 2009. p. 871
4. Nunes E, de Moraes IG, de Novaes PM, Sousa SM. Bilateral fusion of mandibular second molars with supernumerary teeth: Case Report. *Braz Dent J*. 2002;13:137-41.
5. Fidel RA, Carvalho RG, Varela CH, Letra A, Fidel SR, Complicated crown fracture: a case report. *Braz Dent J*. 2006;17:83-6.
6. Finucane D, Kinirons MJ. Non-vital immature permanent incisors factors that may influence treatment outcome. *Endod Dent Traumatol* 1999;15:273-7.
7. Koeings JF, Heller AL, Brilliant JD, Melfi RC, Driskell TD. Induced apical closure of permanent teeth in adult primates using a resorbable form of tricalcium phosphate ceramic. *J Endod* 1975; 1:102-6.
8. Dominguez Reyes A, Munˆoz Munˆoz L, Aznar Martin T. Study of calcium hydroxide apexification in 26 young permanent incisors. *Dent Traumatol* 2005;21:141-5.