

# Clinical Management of a Tooth that Presented with Necrotic Pulp and an Open Apex: A Case Report

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## ABSTRACT

### Introduction:

Pulpal injuries that occur during root development usually present challenges to the treating clinicians. Two approaches are usually taken, which are the apexification or the apexogenesis. Successful treatment is dependent upon prompt diagnosis and complete understanding of the biological processes.

### Aims and objectives

This case study aims to report on six-week follow-ups on a young patient who presented with a necrotic pulp on a tooth with an open apex

### Methods

A 14-year-old female patient presented with a fractured right central incisor tooth. The radiographic examination demonstrated an open apex with internal root resorption. The tooth was filed with ProTaper Next files and irrigated with sodium hypochlorite. Calcium hydroxide was placed in the root canal and the tooth was temporarily restored with glass ionomer material. The patient was seen after six weeks to evaluate the progress of treatment.

### Results

There were signs of apex formation and narrowing of the root canal after the placement of calcium hydroxide

### Conclusions

Apexification was successfully accomplished in a young patient who presented with necrotic pulp that was treated with calcium hydroxide paste.

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#### Key words

Apexification, Apexogenesis, Calcium hydroxide, Mineral trioxide aggregate

#### Author contribution

Dr SN Kabini 60% - Identification and write-up of the case report  
Dr M P Sithole 40% - Reviewing and editing of the case report

## INTRODUCTION

Human teeth tend to complete the development of root canals and apex closure three years after they have erupted.<sup>1</sup> Pupal injuries that occur during this period usually present challenges to the treating clinicians. Two approaches are usually taken, which are the apexification or the apexogenesis. Apexification is defined as a procedure to induce a calcified barrier in a tooth with an open apex or the continuous development of an apex in teeth with incomplete root development and presenting with necrotic pulp.<sup>2</sup> Apexogenesis is a vital pulp therapy procedure that is done to facilitate continued physiological development and formation of the root apex.<sup>3</sup> Successful treatment is dependent upon prompt diagnosis and complete understanding of the biological processes.

The field of dentistry has long been associated with regenerative medicine by the utilization of calcium hydroxide to stimulate tissue repair after pulp exposure. Various dental materials such as mineral trioxide aggregate (MTA) that stimulate tissue regeneration emerged, and this resulted in improvements in the clinical management of pulpal exposures and pulp vitality.<sup>4</sup> Traumatic injuries are the main cause of pulpal damage in anterior teeth, and they occur mostly in young children where the teeth apices are still developing, and such cases will require apexification.<sup>5</sup> Materials such as calcium hydroxide powder and MTA have been successfully used to stimulate apex formation in traumatized or diseased pulp.<sup>1, 2, 6</sup> Apexification utilizing calcium hydroxide involves repeated stimulations with calcium hydroxide, over a period of 6- 24 months, until apical closure is achieved.<sup>7</sup>

#### Case report

A 14-year-old female patient presented at the undergraduate Integrated Clinical Dentistry (ICD) clinic with a fractured right central incisor tooth. A consent for treatment was obtained from the guardian who accompanied the patient to our hospital. The patient was referred to by the emergency department where an emergency root canal treatment was performed on the affected tooth. Thorough medical and dental history were taken and there was no medical contraindication that might affect the success of treatment. The radiographic examination demonstrated an open apex with internal root resorption (Figure 1). The emergency root canal was performed on the affected tooth and the patient was referred to the undergraduate ICD clinic for further management (Figure 2). The tooth was filed and shaped with ProTaper Next files (PTN, Dentsply Tulsa Dental Specialties) and irrigated with 20ml of sodium hypochlorite (NaOCL) (Figure 3). Calcium hydroxide paste (UltraCal™ XS) (Figure 4) was placed in the root canal and the tooth was temporarily restored with glass ionomer material (3M ESPE, St Paul, MN, USA) (Figure 5). The patient was seen after six weeks to evaluate the progress of treatment. An intra-oral radiograph taken after six weeks of treatment



Figure 1: Panoramic radiograph



Figure 2: Intra-oral radiograph after emergency treatment. (Far left)

Figure 3: Intra-oral radiograph after filing with ProTaper Next files. (Left)

Figure 4: Calcium Hydroxide (UltraCal™ XS Ultradent). (Above)



Figure 5: Intra-oral radiograph after placement of calcium hydroxide. (Far left)

Figure 6: Intra-oral radiograph after six weeks review. (Left)

demonstrated signs of apical tissue development (Figure 6). The tooth was now ready to be obturated with a gutter-percha.

## DISCUSSION

Vital pulp therapy is an appropriate treatment for teeth with open apices and has an important role in preserving pulp vitality in young permanent teeth.<sup>8, 9</sup> The success of this treatment is measured by the formation of calcific barrier in teeth with open apices.<sup>1</sup> Tooth fractures that lead to pulpal exposures usually lead to pulp contamination by oral microorganisms. Calcium hydroxide placed inside the root canals dissociates into calcium and hydroxyl ions. The hydroxyl ions destroy the lipids leading to structural damage of bacterial proteins and nucleic acids. The high alkaline pH of Calcium hydroxide stimulates alkaline phosphatase enzyme which releases inorganic phosphate ions. The inorganic phosphate ions produced reacts with calcium ions in the blood forming calcium phosphate.<sup>10</sup> Calcium phosphate, the molecular unit of hydroxyapatite, produces mineralization of hard tissues leading to the formation of a calcific barrier in a tooth with open apex. The disadvantage of using calcium hydroxide for apexification is that it requires numerous appointments to replace calcium hydroxide.<sup>11</sup>

## CONCLUSION

Apexification is the procedure that is performed to induce a calcified barrier on teeth that present with open apices to

promote continuous apical development of incomplete roots presenting with necrotic pulp and was successfully managed by utilizing calcium hydroxide. The apical barrier that is formed will aid in successful completion of an endodontic therapy to ensure proper apical seal.

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