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Induction of Reparative Dentin Following Pulpotomy with Calcium Hydroxide at Four Week Follow up visit: A Case Report

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Abstract

This *in-vivo* study used calcium hydroxide pulpotomy of a premolar tooth to investigate the potential for reparative dentin development without causing unfavorable side effects. For cosmetic reasons, a pulpotomy using calcium hydroxide was used to treat a patient's right first premolar tooth. In order to expose the pulp, a round cavity with a diameter of 2 mm was initially created on the occlusal surface using a flat end fissure bur and a high-speed hand piece under adequate cooling conditions. After using sterile cotton pellets to staunch the bleeding, Dycal was applied to the exposed pulp tissue in accordance with the manufacturer's instructions. The tooth was pulled at 4 weeks under local anesthetic, and it was preserved for 24 hours in 4% neutral buffered formaldehyde. After being demineralized, the specimen was imbedded in paraffin. A blind observer used a light microscope fitted with a digital camera and a computer for histometry to examine a series of sections containing pulp tissue that had been longitudinally serially sectioned at a thickness of 6 µm. lastly, the experimental tooth's amount of newly generated hard tissue was measured. The findings indicated that the exposed pulp tissue is only partially covered by the 0.9 ± 0.2 µm thick layer of reparative dentin development. In conclusion, although it does not entirely cover the exposed pulp, calcium hydroxide can promote reparative dentin production and pulpal lesion healing in exposed teeth.

Keywords: Vital Tooth, Pulpotomy, Calcium Hydroxide, Reparative Dentin Formation

Introduction

A crucial pulp therapy known as pulpotomy involves removing all or part of the coronal pulp and covering the remaining pulp with a pulpotomy substance [1]. The premise of this treatment is that, following the amputation of the permanent teeth's coronal pulp, the remaining pulp is shielded from damage by a substance that stimulates the growth of new tissue and continues to be vital and healthy [2]. Numerous substances, including mineral trioxide aggregate (MTA), adhesive systems, and calcium hydroxide, have been suggested as pulpotomy agents. According to studies [3-5], a material employed as a pulp protective agent needs to be bactericidal, biocompatible, able to promote the creation of hard tissue, and able to build a biological seal that lasts for a long time [6].

For important pulp therapies, calcium hydroxide has traditionally been the preferred material. An alkaline substance known for its bactericidal qualities; calcium hydroxide can cause the development of hard tissue in human teeth [7]. Nevertheless, it has a

number of drawbacks, such as poor sealing and adherence to dentin, erratic dentinal bridge creation, and the existence of tunnel holes in these bridges that could serve as possible entry points for germs [8-10]. However, a histological study is required to clarify the induction of reparative dentin by calcium hydroxide.

Case Report:

A 15-year-old patient with chief complaint of aesthetics visited the Department of Orthodontics. Additional oral examination revealed no anomalies. An intraoral examination found that the top anterior region of the jaw was proclinated. Both percussion and palpation revealed no pain or edema. A tooth's viability is tested. There was no aberrant periapical pathosis found upon radiographic evaluation. He needs his four first premolar teeth extracted for cosmetic repair. A purposeful complete pulpotomy using calcium hydroxide was performed for this investigation in order to measure the quantity of reparative dentin development covering the pulp tissue that was exposed.

Following mouth preparation, a circular cavity with a diameter of 2 mm was created on the upper right first premolar tooth's occlusal surface in order to expose the pulp. This was done by utilizing a high-speed hand piece and a flat end fissure bur (Shofu Dental Corporation, Japan) under adequate cooling conditions. The exposed pulp tissue was coated with Dycal (DENTSPLY, Germany) in accordance with manufacturer's instructions after bleeding was controlled with sterile cotton pellets. To fill the cavity, a composite resin restoration was applied.

Assessment:

Qualitative analysis:

The tooth was pulled at four weeks under local anesthetic, and it was preserved for twenty-four hours in cold 4% neutral buffered formaldehyde. After being demineralized, the specimen was imbedded in paraffin. Following 6µm longitudinal serial sectioning, hematoxylin and eosin was used to stain each section. A light microscope with a digital camera and a computer for histometry was used to observe a series of sections comprising pulp tissue by a blind observer.

Quantitative analysis of new hard tissues:

The amount of new hard tissue formed was assessed from experimental tooth. The area covered by newly formed hard tissue in these sections was measured by using digital, histometry equipment.

Result

At four weeks following pulpotomy, the necrotic tooth in calcium hydroxide exhibited no clinical indications or symptoms of pulpal or periradicular illnesses. The thickness of reparative dentin formation is 0.9 ± 0.2µm and incompletely covers the exposed pulp tissue.

Fig: Dycal

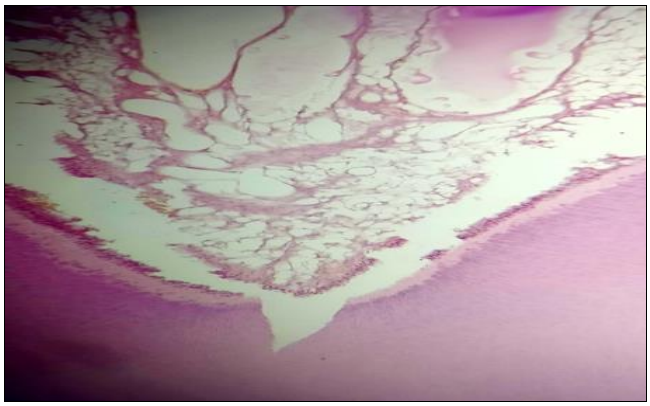

Fig: Histology of reparative dentin

Discussion

The creation of dentinal bridges beneath calcium hydroxide was found to be unpredictable based on histological assessments of pulpal responses to vital pulp treatment. Additionally, pulps coated in calcium hydroxide showed inflammation. Prior research also demonstrated that dentinal bridges developed beneath calcium hydroxide had lesser quality tunnel flaws and thickness compared to MTA and BiodentineTM cement [4-6]. Other adverse observations in calcium hydroxide included foci of necrosis, dystrophic calcifications, and pulpal inflammation [4]. The results of this investigation demonstrated that there is no predictable reaction of the human tooth pulp to calcium hydroxide. Another study, however, showed positive results; pulp necrosis was present but dentinal bridge creation was absent [11].

Another intriguing discovery was that, for four weeks following pulpotomy, the necrotic tooth in calcium hydroxide exhibited no clinical indications or symptoms of pulpal or periradicular illnesses. Research has indicated that the effectiveness of calcium hydroxide-based vital pulp therapy diminishes over time [11]. Consequently, following crucial pulp therapies over an extended period of time is crucial, especially if calcium hydroxide is being employed.

Conclusion

Calcium hydroxide is capable to induce pulpal wound healing and reparative dentin formation in the exposed tooth but it does not completely cover the exposed pulp. More study is needed for conclusive result.

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