Contemporary Pediatric Dentistry

Case Report
Contemp Pediatr Dent 2020:1(1):57-62

Polyethylene fiber post modification with vital pulp therapy in a traumatized immature incisor using Biodentine: A four year follow-up case report

Alem Cosgun[1] ✉, Halenur Altan[2]

Highlights

- It is quite difficult to determine the correct treatment procedure to success in the treatment of dental trauma cases in the form of crown fractures in teeth with immature root formation.
- This case report presents the treatment of the complicated crown fracture with the open apex of the tooth of a delayed admitted patient, with modified polyethylene fiber post.
- This novel treatment type may promise favorable outcome and can be used in such cases.

Abstract

In this case, it was aimed to restore a traumatized permanent incisor with open apex using a modified polyethylene fiber post after amputation as well as to present a four-year long term follow-up. A healthy 10-year-old boy was referred with a complaint of pain caused by tooth number 11. The patient fell and broke his upper incisor ten days ago and no treatment was done before. Total amputation was carried out after clinical and radiological examination. The exposed root pulp was covered with Biodentine™ (Septodent, Saint-Maur-Fosses Codex, France). Glass-ionomer cement (Fuji IX extra, GC Corp., Tokyo, Japan) was placed on the Biodentine™, and after a 3-month follow-up, polyethylene fiber post (Ribbond, Seattle, WA, USA) was placed in the crown since healing was observed in the relevant tooth. The restoration was completed with composite resin (Clearfil Majesty Esthetic Kuraray, Osaka, Japan). Four years later, radiographic examination revealed completed root formation and complete root obliteration. Clinical examination revealed favorable esthetic and functional outcome. Traditional treatments can be modified in order to obtain long term clinical success. Polyethylene fiber post can be used as an alternative method to root canal therapy in complicated crown fractures in teeth with immature root formation due to the advantages such as the possibility of modification according to the crown, aesthetics, easy application, and supporting the vitality of the tooth.

Keywords: Biodentine; Pulpotomy; Ribbond; Tooth Fractures

[1] *Assistant Professor*
Tokat Gaziosmanpaşa University, Faculty of Dentistry, Department of Pediatric Dentistry, Tokat, Turkey
[2] *Associate Professor*
Tokat Gaziosmanpaşa University, Faculty of Dentistry, Department of Pediatric Dentistry, Tokat, Turkey

Correspondence:
Tokat Gaziosmanpaşa University, Faculty of Dentistry, Department of Pediatric Dentistry, Tokat, Turkey
E-mail address:
alemcosgun@hotmail.com

Received: 12 October 2020
Accepted: 01 December 2020
Online First: 15 December 2020

INTRODUCTION

It is quite difficult to determine the correct treatment procedure to succeed in the treatment of dental trauma cases in the form of crown fractures in teeth with immature root formation.[1,2] Generally, treatment options may vary depending on the fracture line level, amount of remaining dental tissue, pulpal conditions, the extent of tooth eruption, the presence of a tooth piece compatible with the remaining tooth structure, root length, and morphology, status of the aesthetic region and patient's aesthetic expectation.[3-5] In teeth with immature root formation, trauma-related exposed pulp responds well to proven vital pulp treatments by preserving pulp vitality and enabling the continuity of root formation.[3,6-8] The success of vital pulp treatments depends on the selection of the correct treatment method as well as the pulp capping material selected. The pulp capping material should be capable of sustaining the pulp vitality, preventing bacterial leakage, resisting the forces during the insertion of restoration and function, enabling the formation of dentin bridge, and should be biocompatible.[9-12]

A total pulpotomy is a treatment method that aims to sustain the vitality of radicular pulp remaining as a result of the complete removal of the coronal pulp tissue.[13] It is indicated in the presence of pathologic change in the pulp within the exposed area of the primary and young permanent teeth with exposed pulp due to decay or trauma, with vital pulp, hemorrhage that can be controlled during the procedure without any existing pathology.[14, 15] This treatment is usually preferred in cases where inflammation in pulp tissue progresses deep into a coronal pulp and perforation area is too large or multiple.[16]

This case report presents a restored traumatized permanent incisor with open apex using a modified polyethylene fiber post (Ribbond) after amputation and four-year long term follow-up.

CASE REPORT

Written informed consent was obtained from the patients and their parents for publication (including all accompanying images). Informed consent was obtained in Turkish, which is the native language of the patients and their parents.

A healthy 10-year-old boy was admitted to our clinic with a complaint of pain caused by tooth number 11. The patient fell and broke his upper incisor ten days ago and no treatment was performed. Clinical evaluation revealed a complicated crown fracture in tooth number 11 with sensitivity in percussion, and palpation. There was no mobility and periodontal damage (Figures 1 and 2). In the radiographic examination, in addition to immature root form, it was observed that the periapical tissues were healthy (Figure 3).

Figure 1. Pre-treatment intraoral view

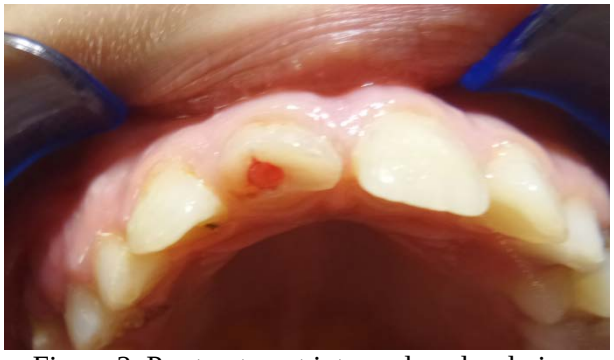

Figure 2. Pre-treatment intraoral occlusal view

Figure 3. Diagnostic periapical radiograph

Local anaesthesia with articaine hydrochloride (2 ml) and adrenaline (0.005 mg/ml) (Maxicaine, VEM, Ankara, Turkey) was applied to the traumatized tooth. The tooth surface was disinfected by wiping with a cotton roll impregnated with 2.5% sodium hypochlorite (NaOCl). The crown pulp was amputated with a high-speed sterile diamond drill (Meisinger, Germany) under water cooling, and then the root pulp at a depth of 3 mm from the root canal orifice was amputated. Hemorrhage was controlled with saline impregnated cotton pellets. After achieving a complete hemorrhage control, Biodentine™ (Septodent, Saint-Maur-Fosses Codex, France) was condensed over the remaining root pulp without applying pressure. After the setting of Biodentine™, it was temporarily covered with glass-ionomer cement (Fuji IX extra, GC Corp., Tokyo, Japan) (Figure 4).

Figure 4. Post amputation periapical radiograph

Healing was observed in the relevant tooth at the end of a three-month follow-up. The glass-ionomer cement was removed, and a cavity where the polyethylene fiber post could be placed was opened (Figure 5). The length of the cavity where the post would be placed was measured with the help of periodontal sond. Polyethylene fiber post (Ribbond, Seattle, WA, USA) with a length of twice the measured length was cut. Since wet resin provides more bonding surface and strength, Ribbond that was cut was wetted with a bond (Clearfil Se Bond, Kuraray, Osaka, Japan) and kept in a light-proof environment until usage in order to avoid polymerization. 37% phosphoric acid (Minitip Etching Gel, 3M ESPE, USA) was applied to the prepared cavity, and then washed and dried. Primer and bond (Clearfil Se Bond, Kuraray, Osaka, Japan) were applied on the cavity surface, respectively, and then polymerized. The fluid composite was applied to the cavity where the post would be placed. The polyethylene fiber post, which became soft and comfortable to form in the bond, was folded in half, and one end was placed in the fluid composite contacting the cavity base with the help of a mouth spatula. The core was created, forming with the aid of a mouth spatula and then polymerized (Figure 6).

Figure 5. View of the cavity before the polyethylene fiber post application

Figure 6. Intraoral view during the polyethylene fiber post application

The restoration was completed using composite resin (Clearfil Majesty Esthetic Kuraray, Osaka, Japan). In the follow-up appointment, the relevant tooth was found to be clinically and radiographically asymptomatic. In the radiographic evaluation performed after four years, it was observed that the root development was completed, and the root canal was completely obliterated, and no problem was observed in the restoration as a result of the clinical evaluation (Figures 7 and 8).

Figure 7. Intraoral view after 4 years

Figure 8. Periapical radiograph after 4 years

DISCUSSION

In crown fractures with exposed pulp sustaining the vitality of pulp enables the continuity of root formation.[17] In this case report, the treatment of the complicated crown fracture with the open apex of the tooth of a delayed admitted patient, with modified polyethylene fiber post and the long term follow-up, were presented.

The time elapsed after the trauma is very crucial in the selection of treatment.[18] In our case, the pulp remained exposed for ten days. There were three critical issues to be considered in the selection of the treatment; first was the delayed admission of the patient, the second was the insufficient remaining coronal dental tissue, and the third was the exposed root. Due to the increased contamination risk and infection depth of the pulp in delayed admissions, root canal therapy, or coronal pulpotomy is applied.[18] Cvek et al.[19] reported limited inflammation in a mechanically exposed and untreated pulp at a depth of 2-3 mm at the end of 7 days. Considering the diagnostic data, pulpotomy was applied to involve the coronal pulpotomy in order to deepen the coronal third of root canal to enable the continuation of root formation.

A structure to support the tooth is formed with posts applied to the root canal system in extensive, complicated crown fractures treated with canal therapy.[20] However, in this case, a modified method was applied since vital endodontic treatment was applied, and it was not possible to insert a post in the root. Plasma-reinforced polyethylene fiber post was used for coronal restoration. Polyethylene fiber post was easily inserted in the crown since it was easy to shape when soft. There was no problem in the restoration part since it bonded with the composite resin. Color stability was right in the long-term follow-up.

Pulp canal obliteration is more common in extrusion, intrusion, and lateral luxation injuries.[21] Pulp canal obliteration is rare than other injuries of permanent teeth with exposed apex, which is considered as a sign of pulp vitality. Pulp canal obliteration is associated with both the type of injury and the patient's age at the moment of trauma since it mainly affects the teeth with immature root formation at the time of injury.[21-24] Since pulp canal obliteration is affected by both loss and reestablishment of the neurovascular supply, the interface between vital periodontal tissues becomes larger as the apical diameter of immature teeth increases from where new nerves and vessels can grow into traumatized pulp eventually increasing the possibility of pulp revascularization.[25]

As dentin thickness increases in teeth with pulp canal obliteration, translucency decreases; thus, they become darker than the adjacent teeth. The colour of crown can turn into yellow or gray.[26] In this case report, potential aesthetic problem was avoided thanks to the modified vital pulp treatment preventing the reflection of potential coloring on the crown as a result of pulp canal obliteration.

CONCLUSIONS

Polyethylene fiber post can be used as an alternative method to root canal therapy in complicated crown fractures in teeth with immature root formation due to the advantages such as the possibility of modification according

to the crown, aesthetics, easy application and supporting the vitality of the tooth.

REFERENCES

1. Rafter M. Apexification: a review. Dent Traumatol 2005;21:1-8
2. Huang GJ. Apexification: the beginning of its end. Int Endod J 2009;42:855-866
3. Olsburgh S, Jacoby T, Krejci I. Crown fractures in the permanent dentition: pulpal and restorative considerations. Dent Traumatol 2002;18:103-115
4. Patni P, Jain D, Goel G. A holistic approach to management of fractured teeth fragments: a case report. Oral Surg, Oral Med, Oral Pathol, Oral Radiol, and Endod 2010;109:70-74
5. Kırzıoğlu Z, Karayılmaz H. Surgical extrusion of a crown-root fractured immature permanent incisor: 36 month follow-up. Dent Traumatol 2007;23:380-385
6. Cvek M. A clinical report on partial pulpotomy and capping with calcium hydroxide in permanent incisors with complicated crown fracture. J Endod 1978;4:232-237
7. Fuks A, Bielak S, Chosak A. Clinical and radiographic assessment of direct pulp capping and pulpotomy in young permanent teeth. Pediatr Dent 1982;4:240-244
8. Witherspoon DE. Vital pulp therapy with new materials: new directions and treatment perspectives—permanent teeth. Pediatr Dent 2008;30:220-224
9. Cohen B, Combe E. Development of new adhesive pulp capping materials. Dent Update 1994;21:57-62
10. Modena KCdS, Casas-Apayco LC, Atta MT, et al. Cytotoxicity and biocompatibility of direct and indirect pulp capping materials. J Appl Oral Sci 2009;17:544-554
11. Queiroz AMd, Assed S, Leonardo MR, Nelson-Filho P, Silva LABd. MTA and calcium hydroxide for pulp capping. J Appl Oral Sci 2005;13:126-130
12. Lee H, Shin Y, Kim S-O, Lee H-S, Cho H-Y, Song JS. Comparative study of pulpal responses to pulpotomy with ProRoot MTA, RetroMTA, and TheraCal in dogs' teeth. J Endod 2015;41:1317-1324
13. Tziafas D. The future role of a molecular approach to pulp-dentinal regeneration. Caries Res 2004;38:314-320
14. Cohenca N, Paranjpe A, Berg J. Vital pulp therapy. Dent Clin 2013;57:59-73
15. McDonald RE, Avery DR, Dean J. Dentistry for the child and Adolescent. 8th ed. St Louis: Mosby, 2004:350-351
16. Smith AJ, Cassidy N, Perry H, et al. Reactionary dentinogenesis. Int J Dev Biol 2003;39:273-280
17. Fuks AB, Chosack A, Klein H, Eidelman E. Partial pulpotomy as a treatment alternative for exposed pulps in crown-fractured permanent incisors. Dent Traumatol 1987;3:100-102
18. Bakland LK. Revisiting traumatic pulpal exposure: Materials, management principles, and techniques. Dent Clin 2009;53:661-673
19. Cvek M, Cleaton-Jones PE, Austin JC, Andreasen JO. Pulp reactions to exposure after experimental crown fractures or grinding in adult monkeys. J Endod 1982;8:391-397
20. Stockton LW. Factors affecting retention of post systems: a literature review. J Prosthet Dent 1999;81:380-385
21. Robertson A, Andreasen F, Andreasen J, Noren J. Long-term prognosis of crown-fractured permanent incisors. The effect of stage of root development and associated luxation injury. Int J Paediatr Dent 2000;10:191-199
22. Andreasen FM, Zhjie Y, Thomsen BL, Andersen PK. Occurrence of pulp canal obliteration after luxation injuries in permanent dentition. Dent Traumatol 1987;3:103-115
23. Oikarinen K, Gundlach KK, Pfeifer G. Late complications of luxation injuries to teeth. Dent Traumatol 1987;3:296-303
24. Hecova H, Tzigkounakis V, Merglova V, Netolicky J. A retrospective study of 889 injured permanent teeth. Dent Traumatol 2010;26:466-475
25. Bastos JV, Côrtes MIdS. Pulp canal obliteration after traumatic injuries in permanent teeth–scientific fact or fiction? Braz Oral Res 2018;32:159-167
26. Robertson A, Andreasen FM, Bergenholtz G, Andreasen JO, Norén JG. Incidence of pulp necrosis subsequent to pulp canal obliteration from trauma of permanent incisors. J Endod 1996;22:557-560

How to cite this article:

Alem Cosgun and Halenur Altan. Polyethylene fiber post modification with vital pulp therapy in a traumatized immature incisor using Biodentine: A four year follow-up case report. Contemp Pediatr Dent 2020:1(1):57-62.

Declarations

Acknowledgements: *Not applicable.*

Conflict of Interest Statement: *The authors disclose no potential conflicts of interest.*

Ethics Statement: *Written informed consent was obtained from the patients and their parents for publication (including all accompanying images).*

Informed Consent: *Informed consent was obtained in Turkish, which is the native language of the patients and their parents..*

Author contributions: *Conception and design: All Authors; Acquisition of data: AC, HA; Interpretation of data: AC, HA; Drafting article: AC, HA; Revision artice: AC, HA; Final approval: All Authors*

Funding: *This work is not finantiated.*

Data Availability: *The data used to support the findings of this study can be made available upon request to the corresponding author.*

Peer-review: *Externally double-blinded peer-reviewed.*