



Fracture Tooth Fragment Reattachment -An Aesthetic Natural Restoration

Dr. Pradnya V. Bansode¹, Dr. Seema D. Pathak², Dr M. B. Wavdhane³,
Dr. Aarti Pathak⁴

1. Head of Department, professor, Department of Conservative Dentistry & Endodontics, GDC & Hospital Aurangabad/MUHS, India

2. Professor, Department of Conservative Dentistry & Endodontics, GDC & Hospital Aurangabad/MUHS, India

3. Associate Professor, Department of Conservative Dentistry & Endodontics, GDC & Hospital Aurangabad/MUHS, India

4. MDS student, Department of Conservative Dentistry & Endodontics, GDC & Hospital Aurangabad/MUHS, India

*Corresponding Author Dr Pradnya V. Bansode

Abstract

Coronal fractures of the anterior teeth are one of the most common form of dental trauma. In case of complex fractures, where the fractured segment is available and there is a close approximation of the segment to the remaining tooth, reattachment of the fractured fragment to the remaining tooth can provide better and long lasting esthetics, improved function, a positive psychological response, and is a faster and less complicated procedure. The procedure is very simple and economic and needs less chair-side time as compared to many conventional methods. This paper reports on coronal tooth fracture case that was successfully treated using adhesive reattachment of fractured fragment and post placement.

Key words: Coronal fracture, dental trauma, reattachment

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I. Introduction

Dentoalveolar traumas are commonly caused by injuries such as contact sports, street fights and traffic accidents and also home accidents.⁽¹⁻³⁾ A study by Murchison, Burke and Worthington⁴ estimated that about one-fourth of the population under the age of 18 years had traumatic injury in anterior teeth and, of this total, 80% were central incisors and 16% were lateral incisors. However, complicated fractures involving crown and root with pulpal exposure constitute only 5%--8% of all traumatic injuries.⁴ A review of published case reports indicate that 85% of traumatized incisors fractured in an oblique fashion from the labial to lingual aspect.⁵ The risk of tooth fracture is further increased when an individual has severe overjet/overbite or an anterior open bite.⁶ The Fracture manifestations can vary from an simple enamel-dentin fracture to complex pulp and root-involving fractures.² Factors that influence the management of coronal tooth fractures include the site of fracture, size of fractured fragments, periodontal status, pulpal involvement, root maturation, biological width invasion, occlusion, and time.^{6,8}

One of the options for managing coronal tooth fractures, especially when there is minimal or no violation of the biological width, and the fractured fragment is retained, is the reattachment of the dental fragment. Reattachment of a fragment can provide good and long lasting esthetics as the tooth's original anatomic form, colour, and surface texture are maintained. Additionally, it generates a positive psychological response and is a reasonably simple procedure that provides a more predictable long-term wear than when a direct composite is used.⁶ The concept of reattachment began in 1964 when Chosak and Eidelman used a cast post and conventional cement to reattach an anterior crown segment.⁹ Tennery was the first to use acid etch technique for the reattachment of fractured tooth fragment.¹⁰ Subsequently, Starkey and Simonsen have reported similar cases.^{11,12} In spite of the high success rates in tooth fragment reattachment reported in the literature^{1,13}

some dentists make decision for other less conservative procedures such as tooth extraction and rehabilitation with implant-supported prosthesis. This may be due to either lack of knowledge of such procedures or fear of failure.¹

Therefore, this article describes the rehabilitation of a crown fracture in the maxillary central incisor by tooth fragment reattachment technique using a glass fiber post to increase retention .

II. Case Report

A 44-year-old female patient reported to the Department of Conservative Dentistry and Endodontics Government Dental College, Aurangabad with the chief complaint of fractured upper anterior tooth due to a road traffic accident, 3 hours before. Patient's medical history was non contributory. Clinical examination revealed horizontal fracture (Ellis class III) in the gingival third regions of the crowns of maxillary left Central incisor [Figures 1 and 2]. Patient was in acute pain and coronal tooth fragment was mobile. No mobility of the remaining tooth was recorded and surrounding intraoral soft tissues were normal. Periapical radiographs revealed an intact periodontal ligament space, complete root formation, and no root fracture in relation to the tooth.

Local anesthesia was administered (1.0 cc of lidocaine 2% with 1 : 80,000 epinephrine) and the fractured segment in relation to 21 was atraumatically removed (Figure 2). It was then cleaned with 2% chlorhexidine solution and stored in isotonic saline solution. Root canal pulp extirpation and canal preparation was performed using the standard step-back method. The prepared teeth were dried with paper-points (Dentsply Maillefer, Tulsa, OK) and filled with laterally condensed gutta-percha (Diadent Group International Inc., Chongju, Korea) and Sealapex (Kerr, Manufacturing Co., Romulus, MI) root canal sealer . After completion of RCT on 21 (Figure 1(c)) , post space was prepared using GG drills and Peeso reamers leaving 5 mm of the filling material at the apex to maintain a good seal. A post hole within coronal fragment was prepared using a drill . . An esthetic post of diameter 1.1 mm (Angelus, REFORPOST, Londrina, Brazil) was selected .The post space was etched for 15 seconds using 37% phosphoric acid (DPI Tooth conditioner gel, Dental Products of India, Mumbai, India) after which it was then rinsed thoroughly with water and excess water was removed with a cotton pellet. Next the adhesive (Prime & Bond NT, Nanotechnology Dental adhesive, Dentsply, St. Paul, MN, USA) was applied on the etched surface as well as the post. The adhesive was airthinned and light-cured for 10 seconds. The post was then luted with resin cement (Multilink, Ivoclar, Vivadent) with 2 mm of its coronal portion extending into the chamber (Figure 1(d)). . A full thickness buccolingual mucoperiosteal flap was raised with an intrasulcular incision (Figure3). After all debris on the fractured root surface was scaled, washed away with sterile serum physiologic ,tooth fragment was reattached using resin cement .The excess resin was removed with an excavator and the crown was light cured for 40 seconds from both buccal and palatal aspects. Final polishing of the crownroot interface was made with ultrafine diamond burs and polishing disks. The tooth fragment was stabilised with physiological splinting with ligature wire and resin cement . After all, the flaps were sutured (Figure 4). One week later, the sutures were removed and clinical examination was revealed proper healing . One month later, the clinical and radiographic examinations revealed a stable reattachment of the crown fragment .

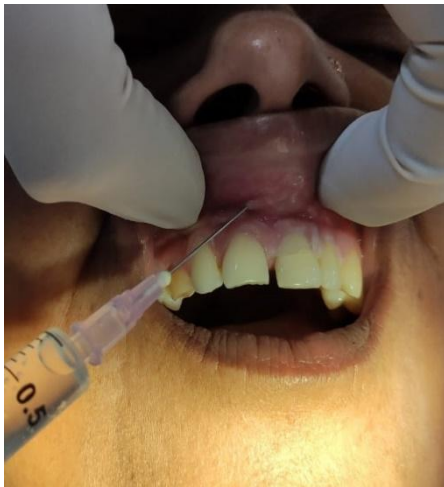
PRE OPERATIVE LABIAL VIEW



RADIOGRAPHIC ASSESSMENT



REMOVAL OF FRACTURED FRAGMENT
ATRAUMATICALLY



Fractured fragment stored in 25%
to prevent drying & desiccation



AFTER REMOVAL OF THE FRACTURED FRAGMENT

POST OBTURATION
RADIOGRAPH



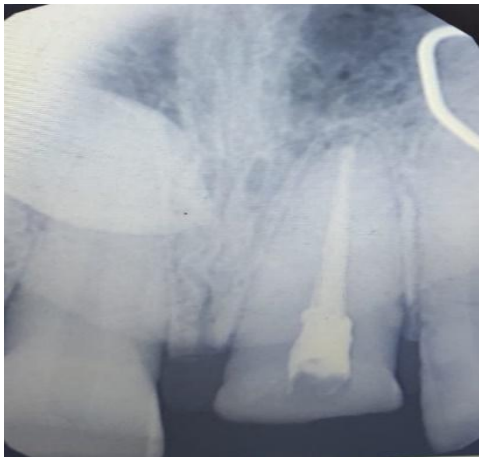
LABIAL VIEW

POST SPACE PREPARATION



PALATAL VIEW

AFTER COMPLETION OF ROOT CANAL TREATMENT



SELECTION OF POST



POST PLACEMENT



REFLECTION OF FLAP



Intraoral photograph after reattachment of fractured segment and suture placement.(labial view)



AFTER COMPLETION OF FINISHING AND
POLISHING



III. DISCUSSION

Conventional approaches to rehabilitating fractured anterior teeth include either composite restorations or a post-core supported prosthetic restoration when the tooth has had pulpal exposure and extensive fracture of the crown.^{15,16,17} The fractured segment is usually removed and post core and crown restoration is done after root canal therapy. However, disadvantages of these two alternatives are the reduced aesthetic results (both immediately and in the long term) due to discoloration in case of composite resin restorations and aggressiveness of tooth preparation in case of post-core full crowns. Hence the use of tooth fragment reattachment technique to preserve the fractured segment of a tooth has been advised in the literature for decades^{10,12}, which offers better short^{18,19} and medium-term²⁰ results compared to resin composite restorations. This technique is more so encouraged nowadays due to the advent of improved newer adhesives, especially in the case of younger patients. It is an optimal approach for restoring fractured anterior teeth, when the fragment is available.^{20,21,22} The fractured fragment has been proposed as a favourable crown repair material due to its superior morphology, conservation of structure, and patient acceptance.²¹ It requires minimal tooth preparation, is more esthetic, faster to reattach than a composite resin restoration, and has a psychological benefit to the patient that his own tooth has been retained. The loss of vitality followed by proper endodontic therapy proved to affect tooth biomechanical behaviour only to a limited extent. Whether it is because of caries or restorative procedures, the tooth strength is always reduced in proportion to coronal tissue loss. So more is the coronal tooth loss, more is the reduction in tooth strength. Therefore, the key strategy to restore endodontically treated tooth is to minimize the removal of tooth structure, especially in the cervical region to maximize the ferrule effect, to use adhesive procedures at both radicular and coronal levels to strengthen remaining tooth structure, and to optimize restoration stability and retention and use post and core materials with physical properties similar to those of natural dentin, because of the limitations of current adhesive procedures.²³ The concepts that support this therapeutic option are similar to that of endocrowns^{24,25} but with the original tooth fragment as the ideal material, avoiding the use of artificial materials which require further tooth demolition and preparation to obtain mechanical retention, deep posts, and ferrule for conventional restorations. The use of cast metal cores was also associated with wedge effect which may lead to tooth fracture²⁶, whereas adhesion of prefabricated posts has limited long-term stability.^{27,28} Also, maintaining as much enamel as possible is an advantage when using endocrowns, porcelain veneers, or tooth fragments due to increased bond strength of adhesives on enamel.^{29,30} In this case report, conventional treatment may have led to postcore crowns or even extraction and implant placement. But considering important factors like the patient's age, the irretrievability of the restoration in case of failure, and the possibility of postponing more aggressive treatment without any negative implications, a more conservative approach was decided.

IV. CONCLUSION

Considering the high incidence of dental fractures as a result of trauma, the working knowledge of the dentist regarding treatment possibilities is essential. Tooth fragment reattachment should be performed whenever possible because it is a simple, fast, and affordable procedure and presents a predictable esthetic result.

REFERENCES

- [1]. Rajput A, Ataide I, Fernandes M. Uncomplicated crown fracture, complicated crown-root fracture, and horizontal root fracture simultaneously treated in a patient during emergency visit: a case report. *Oral Surg Oral Med Oral Pathol Oral Radiol Endod.* 2009;107:e48--52.
- [2]. Oz IA, Haytac, MC, Toroglu MS. Multidisciplinary approach to the rehabilitation of a crown-root fracture with original fragment for immediate esthetics: a case report with 4-year follow-up. *Dent Traumatol.* 2006;22:48--52.
- [3]. Durkan RK, Ozel MB, Celik D, Bağis, B. The restoration of a maxillary central incisor fracture with the original crown fragment using a glass fiber-reinforced post: a clinical report. *Dent Traumatol.* 2008;24:e71--5.

- [4]. Murchison DF, Burke FJ, Worthington RB. Incisal edge reattachment: indications for use and clinical technique. *Braz Dent J*. 1999;186:614--9
- [5]. Bastone EB, Freer TJ, & McNamara JR (2000) Epidemiology of dental trauma: A review of the literature *Australian Dental Journal* 45(1) 2-9.
- [6]. Baratieri LN, Monteiro S Jr, & Andrada MAC (1990) Tooth fracture reattachment: Case reports *Operative Dentistry* 21(4) 261-270.
- [7]. Macedo GV, Diaz PI, Fernandes CAO, & Ritter AV (2008) Reattachment of anterior teeth fragments: A conservative approach *Journal of Esthetic and Restorative Dentistry* 20(1) 5-2
- [8]. Baratieri LN, Monteiro S Jr, Andrada MAC, Vieira LCC, Cardoso AC, & Ritter AV (1995) Estética: Restaurações Adesivas Diretas em Dentes Anteriores Fraturados *Quintessence*, São Paulo
- [9]. Chosak A, Eidelman E. Rehabilitation of a fractured incisor using patient's natural crown: Case report. *J Dent Child* 1964;31:19-21.
- [10]. Tenny NT. The fractured tooth reunited using the acid-etch bonding technique. *Tex Dent J* 1978;96:16-7.
- [11]. Starkey PE. Reattachment of a fractured fragment to a tooth – A case report. *J Indiana Dent Assoc* 1979;58:37-8.
- [12]. Simonsen RJ. Restoration of a fractured central incisor using original teeth fragment. *J Am Dent Assoc* 1982;105:646-8
- [13]. Nogueira Filho G, da R, Machion L, Teixeira FB, Pimenta LA, Sallum EA. Reattachment of an autogenous tooth fragment in a fracture with biologic width violation: a case report. *Quintessence Int*. 2002;33:181-4.
- [14]. Nogueira Filho G, da R, Machion L, Teixeira FB, Pimenta LA, Sallum EA. Reattachment of an autogenous tooth fragment in a fracture with biologic width violation: a case report. *Quintessence Int*. 2002;33:181-4.
- [15]. J. O. Andreasen and F. M. Andreasen, *Textbook and Color Atlas of Traumatic Injuries to the Teeth*, Blackwell, Oxford, UK, 4th edition, 2007.
- [16]. J. De Munck, K. Van Landuyt, M. Peumans et al., "A critical review of the durability of adhesion to tooth tissue: methods and results," *Journal of Dental Research*, vol. 84, no. 2, pp. 118–132, 2005
- [17]. N. Zerman and G. Cavalleri, "Traumatic injuries to permanent incisors," *Endodontics & Dental Traumatology*, vol. 9, no. 2, pp. 61–64, 1993 .
- [18]. A. D. Loguercio, J. Mengarda, R. Amaral, A. Kraul, and A. Reis, "Effect of fractured or sectioned fragments on the fracture strength of different reattachment techniques," *Operative Dentistry*, vol. 29, no. 3, pp. 295–300, 2004
- [19]. A. Reis, A. D. Loguercio, A. Kraul, and E. Matson, "Reattachment of fractured teeth: a review of literature regarding techniques and materials," *Operative Dentistry*, vol. 29, no. 2, pp. 226–233, 2004.
- [20]. F. M. Andreasen, J. G. Noren, J. O. Andreasen, S. Engelhardt, and U. Lindh-Stromberg, "Long-term survival of fragment bonding in the treatment of fractured crowns: a multicenter clinical study," *Quintessence International*, vol. 26, no. 10, pp. 669–681, 1995.
- [21]. D. P. Lise, L. C. C. Vieira, E. Araújo, and G. C. Lopes, "Tooth fragment reattachment: the natural restoration," *Operative Dentistry*, vol. 37, no. 6, pp. 584–590, 2012
- [22]. V. Badami and S. K. Reddy, "Treatment of complicated crownroot fracture in a single visit by means of rebonding," *Journal of the American Dental Association*, vol. 142, no. 6, pp. 646–650, 2011.
- [23]. D. Dietschi, O. Duc, I. Krejci, and A. Sadan, "Biomechanical considerations for the restoration of endodontically treated teeth: a systematic review of the literature. Part II (Evaluation of fatigue behavior, interfaces, and in vivo studies)," *Quintessence International*, vol. 39, no. 2, pp. 117–129, 2008.
- [24]. P. Magne, A. O. Carvalho, G. Bruzi, R. E. Anderson, H. P. Maia, and M. Giannini, "Influence of no-ferrule and no-post buildup design on the fatigue resistance of endodontically treated molars restored with resin nanoceramic CAD/CAM crowns," *Operative Dentistry*, vol. 39, no. 6, pp. 595–602, 2014.
- [25]. F. Zarone, R. Sorrentino, D. Apicella et al., "Evaluation of the biomechanical behavior of maxillary central incisors restored by means of endocrowns compared to a natural tooth: a 3D static linear finite elements analysis," *Dental Materials*, vol. 22, no. 11, pp. 1035–1044, 2006.
- [26]. A. S. Fernandes and G. S. Dessai, "Factors affecting the fracture resistance of post-core reconstructed teeth: a review," *International Journal of Prosthodontics*, vol. 14, no. 2, pp. 117–129, 2001.
- [27]. S. Mazzoleni, F. Graf, E. Salomon, F. Simionato, C. Bacci, and E. Stellini, "Influence of root canal posts on the reattachment of fragments to endodontically treated fractured incisors: an in vitro experimental comparison," *Journal of Esthetic and Restorative Dentistry*, vol. 28, no. 2, pp. 92–101, 2016.
- [28]. A. Ramírez-Sebastián, T. Bortolotto, M. Cattani-Lorente, L. Giner, M. Roig, and I. Krejci, "Adhesive restoration of anterior endodontically treated teeth: influence of post length on fracture strength," *Clinical Oral Investigations*, vol. 18, no. 2, pp. 545–554, 2014.
- [29]. J. De Munck, K. Van Landuyt, M. Peumans et al., "A critical review of the durability of adhesion to tooth tissue: methods and results," *Journal of Dental Research*, vol. 84, no. 2, pp. 118–132, 2005.
- [30]. M. Peumans, P. Kanumilli, J. De Munck, K. Van Landuyt, P. Lambrechts, and B. Van Meerbeek, "Clinical effectiveness of contemporary adhesives: a systematic review of current clinical trials," *Dental Materials*, vol. 21, no. 9, pp. 864–881, 2005