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**CASE REPORTS :**

# Reattachment of fractured tooth fragment : A conservative approach toward restoration of fractured anterior teeth

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**Abstract**

Dental trauma is such a situation where in the patient is not only affected psychologically but also socially. During their first dental consultation, these patients are suffering and need emergency treatment. They are quite anxious because of affected functions, esthetics, and phonetics. The principal objective while handling such cases of dental trauma is to manage successfully the pain and to restore immediately function, esthetics, and phonetics. Nowadays, dentists are able to use the patient's own fragment to repair the fractured tooth. Reattachment is such an ultraconservative technique which offers safe, fast, and esthetically satisfying results. This paper discusses fragment reattachment technique and presents two clinical cases of crown fracture.

**Key words**

Reattachment, fractured fragment, trauma, adhesive system, esthetics.

## Introduction

Traumatic tooth fractures are a common reason for seeking dental care [1]. This fracture causes not only damage to the tooth but also a negative effect to the patient's psychology. It is rehabilitation is one of the challenges for the dentist from an esthetic, functional, emergency management with a long-lasting restoration [2].

Various treatment modalities have been practiced to restore the fractured anterior teeth; one of them fragment's reattachment if it is available and repositionable [3]. This technique ensures to the patient a suitable and durable esthetics, sufficient mechanical retention and satisfactory life expectancy. All this thanks to a relatively fast procedure but which requires a good management of the steps of the clinical protocol in order to improve the prognosis [2, 3, 4, 5].

The purpose of this article is to discuss the considerations for dental fragment reattachment technique and to present two clinical case reports of fracture to the anterior maxillary region.

## Cases reports

***Case 1:***

A 7 year old female patient reported to the Department of Restorative Dentistry and endodontics, Farhat Hachad Hospital, following trauma to the maxillary central incisor. She had a history of fall from a chair 20 hours ago. The medical history of the child was found to be insignificant.

Intraoral clinical examination revealed Ellis class III fracture of tooth 11(involvement of enamel and dentin compromising the pulp) and Ellis class II fracture of tooth 21 (involvement of enamel and dentin) as shown in figure 1a, and 1b. The fracture lines were oblique. No other injury was associated.

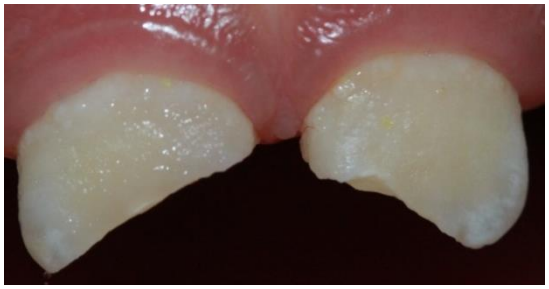

**Figure 1a:** Preoperative clinical view of upper anterior fractured theeth

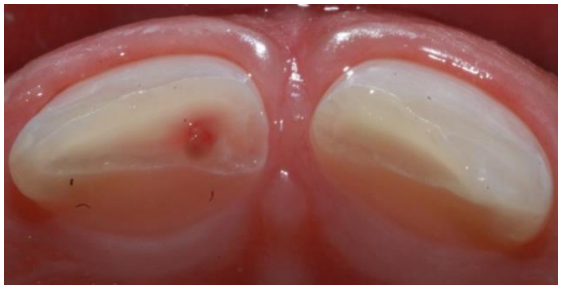

**Figure 1b:** Preoperative occlusal view of the fractured teeth showing a light involvement of the pulp on tooth 11

**Figure 1c:** Facial view of the fractured fragment of tooth 11.

The child's parent brought a broken crown fragment along with him (fig 1c) that was immediately maintained in normal saline during the whole period prior to restoration. Following a detailed examination, the adaptation of the fragment revealed that it belung to the tooth 11. The crown portion of tooth 21 was not retrained by the patient. The cold pulp tester for the two teeth was positive.

No mobility of the injured teeth was recorded and surrounding tissues were healthy. A periapical radiograph showed that the root formation was incomplete with no extrusion (fig 2) .The treatment plan included a reattachment of the broken fragment of tooth 11and composite resin restoration of tooth 21 with stratification technique.

**Figure 2:** Periapical radiograph of the anterior upper teeth

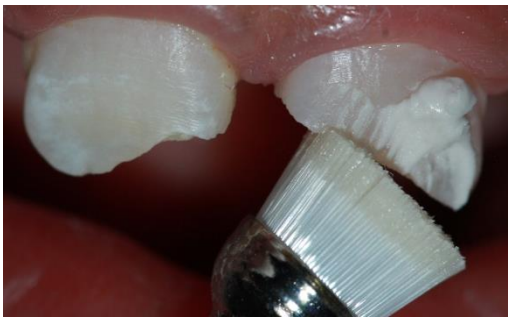

**Figure 3:** Surfaces polishing

First, the teeth surfaces were polished using a brush with an abrasive paste to eliminate the plaque (fig 3).

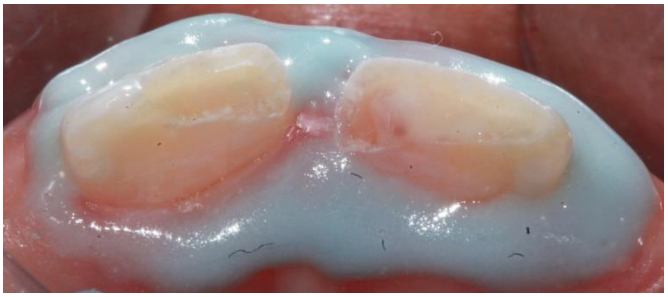

**Figure 4:** Pulp cupping of tooth 11 using light cured calcium hydroxide

**Figure 5a:**Internal groove preparation within the dentine of the fractured fragment using a diamond bur.

**Figure 5b:** Internal dentinal groove

The teeth were isolated with light cured dam. As the coronal pulp of tooth 11 was exposed, cupping technique was decided using light cured radiopaque dental calcium hydroxide paste, Cal LC®, Fusion (fig 4). Regarding the cupping material, an internal dentinal groove was prepared within the dentine of the fractured fragment using a diamond bur as shown in figures 5a and 5b.

**Figure 6a :**Acid etching of the line fracture surface of tooth 11 with 37% orthophosphoric acid

**Figure 6b :** Acid etching of the fractured fragment with 37% orthophosphoric acid

**Figure 7a :** Application of the bonding agent on the line fracture surface of tooth 11

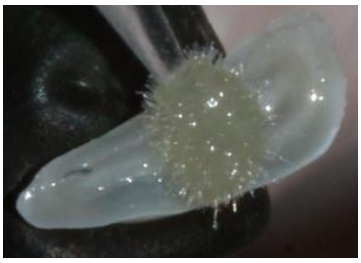

**Figure 7b :** Application of the bonding agent on the fractured fragment.

Acid etching of the line fracture surface and the fractured fragment surface were carried out for 20 seconds with 37% orthophosphoric acid (fig 6a,b). Bonding agent was subsequently applied, air-dried gentlyand light cured for 20 s (fig 7a,7b).

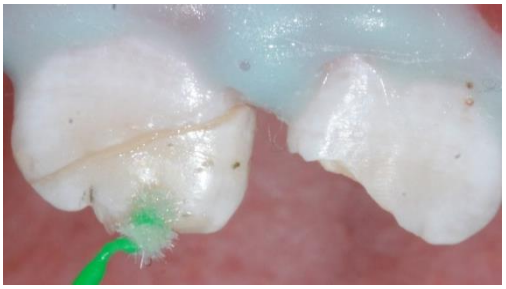

**Figure 8a :** Reattachement of the fractured fragment

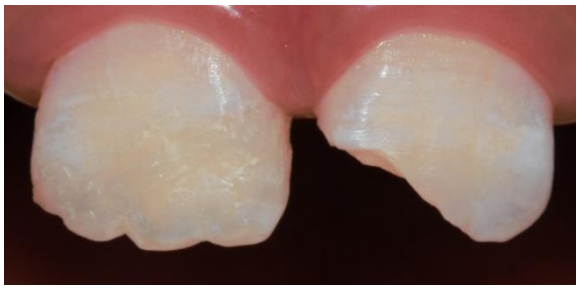

**Figure 8b :** Finishing of the tooth surfaces

**Figure 8c**: Result after 48 hours: reattachment of the broken fragment of tooth 11and composite resin restoration of tooth 21 with stratification technique.

The tooth fragment was then reattached to its proper position (fig 8a). Visible light polymerization was done for 60 seconds while fragment was kept in position under pressure.

To improve the esthetics, a deep chamfer was placed at the fracture line after bonding. Then the composite resin was applied over that and light cured. Using a long needle shaped finishing bur, the labial surface was polished. Finishing of the lingual surface was done using an egg shaped finishing bur. The tooth was functional and esthetically pleasing (fig 8b). Occlusion was checked and post operative instructions to the patient were given to deter from loading the anterior teeth.

Tooth 21 was restored with composite resin by stratification method.

Forty eight hours later, the patient returned for control of tooth hydration (fig 8c).

We make controls 1, 2, 6months and 1year after trauma, in which we make tests for dentinal sensitivity with ethyl chloride and a periapical radiograph of the concerned tooth.

***Case 2:***

A 21 year old female patient came to the department of Conservative Dentistry and Endodontics, Sahloul Hospital, Sousse, presenting a traumatic crown fracture of the tooth 11. She had a history of a fall 2 hours ago. The patient had preserved the broken fragment dry that was checked for goodness of adaptation to the tooth. The fractured fragment was intact and preserved immediately in saline solution (fig 1). The medical history was not contributory. Intraoral clinical examination revealed that tooth 11 had horizontal Ellis class II fracture involving enamel and dentin (fig 2).

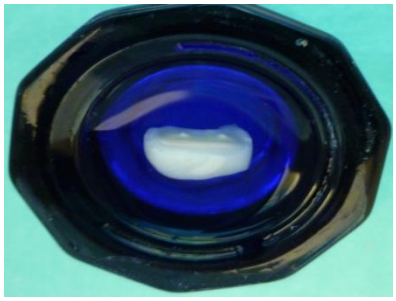

**Figure 1:** fractured fragment in saline solution

**Figure 2:** horizontal Ellis class II fracture

A retention gutter, using a diamond round bur, was done at the expense of the fractured fragment at the dentino-enamel junction(fig 3). Surfaces of both fractured fragment and the tooth were prepared with orthophosphoric acid at 37 % (fig 4), bonding agent was applied (fig 5), and flow composite resin was used to replace the fragment (fig 6) and photopolymerisation was done in different directions for 90 s.

**Figure 3:** Gutter for retention

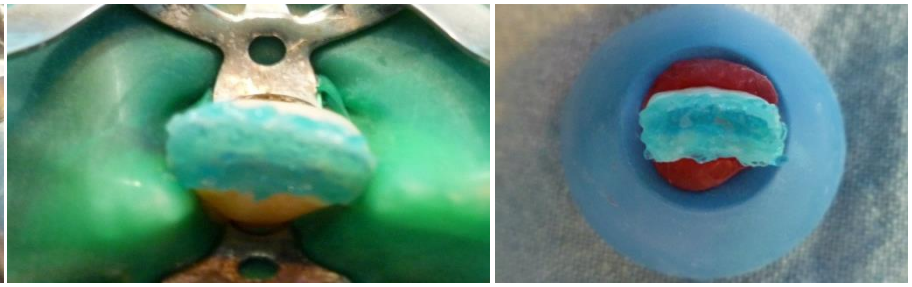

**Figure 4:** Preparation of fractured fragment and the tooth with 37%Orthophosphoric acid

**Figure 5:**Bonding application to the tooth and fractured fragment

**Figure 6:** Reattachment of the fragment with flowable composite resin

**Figure 7:** Rehydratation of the fragment after 3 weeks

## Discussion

Traumatic injuries are common emergencies mainly affecting children and adolescents. Coronal fractures of permanent incisors account for 18-22% of all dental traumas, among which 96% involve maxillary central incisors [6].

Fractures of the anterior teeth in addition to affecting the function, and esthetics, can distress the psychological and social well-being of the patient [6,7]. The management should be immediate and efficient [2].Overtime, numerous techniques have been proposed for the reconstruction of fractured teeth, such as partial or full coverage crowns, orthodontic bands, ceramic veneers and resin composite restorations with and without pins. Besides of being time consuming and high priced, all of those methods are not conservative and may sacrifice healthy tooth structure too much[6, 9].In addition, prosthodontic restorations in younger

patients are associated with confounding variables such as large pulp, progressive eruption, and gingival marginal stability [7].

In case of an available intact fractured tooth fragment, reattachment technique offers the advantages of being highly conservative with the preservation of natural tooth structure, can be completed in one chair side time. It promotes a natural appearance for the patient that provides good acceptance, best esthetic results as natural tooth shape, contour, surface texture, occlusal alignment and color [2, 3, 4, 5].

Several factors influence the management of coronal tooth fractures, such as biological width violation, endodontic involvement, pattern of fracture, presence or absence of fractured fragment, restorability of tooth, occlusion, material and technique used for reattachment [10].

One of the factors affecting the success of the reattachment is the hydration of the fractured segment while outside oral cavity is one of them. This is necessary to maintain the vitality and original esthetic appearance of the tooth and also ensures adequate bond strength [9].

In both clinical cases, preservation environment was saline.

Milk or the white of egg are very used for the expelled teeth as environment conservation. Indeed, because of their PH and their osmolarity, they allow the preservation of the vitality of the periodontal ligamentary cells. Many authors extrapolated these results in the dental fragments [11]

Shirani and al in 2011 studied 60 mandibular incisors fractured the fragment were conserved during 24h in different solution: water, milk, dry environment, solution saline. After reattachment of the fragment and applying a force in the vestibular area of the tooth of 1 mm /min until rupture, they noticed a significant difference in fracture resistance depending on the solution of preservation. Milk or saliva gave the highest resistance. Indeed, calcium and phosphate contained in milk and saliva harden dentin and ensure remineralization [12].

Several other studies present, in a descending order, the best environment of stokage: solution of dextrose 50%, egg-white, milk, saliva and distilled water [12, 13].

The rehydration of the fragment in these environments allows collagen fibers to find their original shape and to improve the penetration of the monomer of the resin within the dentin [14].

In the daily clinical practice, 30 min of rehydration would be sufficient to obtain retention and a satisfactory esthetics [14].

The adhesive procedures for reattachment should be carried out away from saliva or gingival fluids. If the rubber dam cannot be placed, as in the first case (due to the incomplete eruption of the tooth), light cured dam can protect our operating field.

Concerning the gluing system, it is recommended to use an adhesive in combination with a resin than a single adhesive [1].

Regarding the mechanical preparation before fragment reattachment, it has been found that internal grooves are well recommended [2].

For this reason, in our cases we opted for the realization of this mechanical preparation, having a major influence on the esthetic and mechanical rendering.

Recently, a study was conducted by Abdulmujeeb et al to evaluate the fracture strength recovery of re-attached anterior fractured tooth fragment by using different re-attachment techniques. They concluded that over contour and internal dentinal groove showed excellent performances as compared with simple reattachment and external chamfer [2].

Materials used for reattachment seem to be less important than technique for a successful treatment.

Studies have shown that the sole use of an adhesive system or in combination with other materials such as flowable resins, resin cements and resin composites had led to similar results when the fragment was reattached. However, despite the statistical similarity, there was a trend towards improving fracture strength when the adhesive system was combined with a resin composite, which was most likely caused by the improved mechanical properties of this material [2]. In such cases, adhesives and composite resin materials should

correspond to each other. Regarding the adhesive system, self-etching adhesives have shown less fracture strength of the reattachment than multi-bottle adhesives.

Patient with coronal fractures should be followed for 3, 6, 12months and yearly for 5 years. Esthetics as well as pulp vitality is confirmed both clinically and radiographicallyat these follow-up visits [15].

**Conclusion**

Reattachment of fractured fragment is faster, easier, and cost effective. Highest strength can be achieved by using a combination of techniques and bonding materials. Hence, reattachment of fractured fragments can be a preferred technique.

**REFERENCES :**

1. **Silva JS, Cohen-Carneiro F, Medina PO, Queiroz AC, Herkrath APCQ, Pontes DG**
Clinical and subjective success of tooth fragment reattachment: a case series.
*Gen Dent. 2021 Nov-Dec;69(6):18-23.*

2. **Soliman S, Lang LM, Hahn B, Reich S, Schlagenhauf U, Krastl G, Krug R**
Long-term outcome of adhesive fragment reattachment in crown-root fractured teeth.
*Dent Traumatol. 2020 Aug;36(4):417-426. doi: 10.1111/edt.12550. Epub 2020 Feb 24*

3. **Arias Z, Falú Hinojosa Ledezma H, Patricia Osorio Terán C, Omori K, Yamamoto T, Zahedul Islam Nizami M, Takashiba S**.
Reattachment of Fractured Tooth Fragment by Multidisciplinary Treatment Approach.
*Bull Tokyo Dent Coll. 2023 Mar 7;64(1):13-22. doi: 10.2209/tdcpublication.2022-0019. Epub 2023 Feb 15.*

4. **A. F. Pavone, M. Ghassemian, M. Mancini, R. Condò, L. Cerroni, C. Arcuri, and G. Pasquantonio.**
Autogenous Tooth Fragment Adhesive Reattachment for a Complicated Crown Root Fracture: Two Interdisciplinary Case Reports
*Hindawi Publishing Corporation, Case Reports in Dentistry 2016, Article ID 9352129, 7 p*

5. **Almulhim KS, Oliveira-Haas L**
Fragment Reattachment: A 4-Year Case Report of Uncomplicated Dental Fractures.
Int J Periodontics Restorative Dent. 2023 Nov 3;43(6):707-703. doi: 10.11607/prd.6222

6. **Trivedi S, Bansal A, Kukreja N, Trivedi A, Chhabra S, Deswal R, Gill P, Jain A**
Evaluation of Fracture Resistance of Reattached Fractured Tooth Fragment Stored in Different Storage Media: An *In Vitro* Study.
*J Contemp Dent Pract. 2022 Feb 1;23(2):221-225.*

7. **M. Manju, S. L. Shanthraj, K. C. Savitha, N. Sethi.**
Esthetic and biologic mode of reattaching incisor fracture fragment utilizing glass fiber post
*J Nat Sci Biol Med. 2015 Jul-Dec; 6(2): 446–8.*

8. **P. Mahesh Patni, P. Jain, M. Jain Patni**
A Conservative Approach to the Management of a Dental Trauma for Immediate Natural Esthetics
*Arch Trauma Res. 2016; 5(2):e29042*

9. **C. M. Sapna, R. Priya, N. B. Sreedevi, R. R. Rajan, K. Renjith**
Reattachment of Fractured Tooth Fragment with Fiber Post: A Case Series with 1-Year Followup

*Hindawi Publishing Corporation, Case Reports in Dentistry 2014, Article ID 376267, 5 pages*

**10. Sarapultseva M, Sarapultsev A.**

Long-term results of crown **fragment reattachment** techniques for **fractured** anterior teeth: A retrospective case-control study.

*J Esthet Restor Dent. 2019 May;31(3):290-294. doi: 10.1111/jerd.12456. Epub 2019 Feb 20*

**11. Gopal R, Raveendran L, Pathrose SP, Paulaian B**

Management of Tooth Fractures Using Fiber Post and Fragment Reattachment: Report of Two Cases.

*J Pharm Bioallied Sci. 2017 Nov;9(Suppl 1):S295-S298. doi: 10.4103/jpbs.JPBS_111_17*

12. **Brasil Maia G, Pereira RV, Poubel DLDN, Almeida JCF, Dias Ribeiro AP, Rezende LVML, Garcia FCP**

Reattachment of fractured teeth using a multimode adhesive: Effect of different rewetting solutions and immersion time.

*Dent Traumatol. 2020 Feb;36(1):51-57. doi: 10.1111/edt.12506. Epub 2019 Sep 8*.

**13. F. Shirani, V. Sakhaei Manesh, MR. Malekipour.**

Preservation of coronal tooth fragments prior to reattachment.

*Dent Traumatol. 2022 Aug;38(4):319-324. doi: 10.1111/edt.12745. Epub 2022 Mar 12.*

14. **Garcia FCP, Poubel DLN, Almeida JCF, Toledo IP, Poi WR, Guerra ENS, Rezende LVML**

Tooth fragment reattachment techniques-A systematic review.

*Dent Traumatol. 2018 Jun;34(3):135-143. doi: 10.1111/edt.12392. Epub 2018 Apr 26.*

**15. Khandelwal P, Srinivasan S, Arul B, Natanasabapathy V**

Fragment reattachment after complicated crown-root fractures of anterior teeth: A systematic review

*Dent Traumatol. 2021 Feb;37(1):37-52. doi: 10.1111/edt.12602. Epub 2020 Sep 9*