



Research Article

NURTURE THE NATURAL – COMPREHENSIVE MANAGEMENT OF COMPLICATED CORONAL TOOTH FRACTURE THROUGH REATTACHMENT

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ABSTRACT

**Aim and background:** Complicated crown-root fractures constitute a major share of all dental injuries, most commonly affecting the maxillary anterior teeth. Managing discomfort and restoring function and appearance as soon as possible are the major goals of treating such complex crown fractures. When the broken segments are very close, endodontic therapy followed by reattaching the fractured segment using fibre post reinforcement is an appropriate solution. This procedure offers outstanding aesthetics since it keeps the teeth's original contacts, contour, translucency, alignment, surface texture, and location.

**Case report:** A 27-year-old male reported to the clinic immediately following a road traffic accident. Clinical and radiographic examination revealed a complicated oblique fracture that was extending subgingivally in the palatal aspect in relation to 21 and 22. It was decided to perform a single visit root canal treatment followed by reattachment of the fractured segment using fiber-reinforced post. A midline diastema was noted following the attachment of the fractured segment which was corrected using direct composite resin restoration.

**Conclusion:** The presented case demonstrates conservative management of complicated crown root fracture involving 21 and 22 by reattachment using fiber-reinforced post followed by midline diastema correction using composite resin.

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INTRODUCTION

Traumatic tooth fractures are the major reason for seeking dental care. It is most common in children and adolescent affecting primary and permanent dentition. Maxillary anterior are the most commonly fractured teeth with central incisors having highest incidence about 80% and 16% for lateral incisors(3). There are several factors that influence management of fractured coronal fragment such as Invasion of biologic width, Pulpal involvement, Associated Alveolar bone fracture, Restorability of fractured tooth, Trauma to soft tissue, Presence or absence of fractured fragment and its approximation, Occlusion, Esthetics, Finances, Prognosis. Thus, soft and hard tissues surrounding the teeth should be considered while managing fractured tooth fragments, in-order to achieve favourable prognosis. The treatment options are divided into a conservative or invasive. conservative approach includes the orthodontic band, pin retained restoration, and reattachment or Invasive procedures such as placement of full coverage crowns, post and core. Amongst all these procedures, fragment reattachment is considered as the most conservative approach and is called biologic restoration as it facilitates the reattachment of natural tooth fragment. The first case report on reattachment of a fractured incisor fragment was published by Chosack and Eidelman in 1964.

Fragment reattachment has tremendous advantages over other procedures such as it is Quick, Aesthetic, Patient suffer minimal psychological and social trauma, Highly economical. Nowadays a number of successful reattachment cases and research are reported in literature. Still, the prevalence of reattachment procedures is low especially among general dental practitioners. It can be due to either lack of knowledge of such procedures or fear of failure.

Incidence

Coronal fractures represent a high proportion of the dental trauma in the permanent dentition ranging between 26 and 76% of dental injury, and approximately 16% of coronal fractures are complicated presenting pulp exposure. The reports suggest that 70% of such injuries involve the maxillary central incisors followed by maxillary lateral incisors and mandibular incisors(1-4).

Depending on age, the incidence is higher in male than in female, with male: Female ratios varying from 2:1 to 3:1.5. Prevalence of trauma to maxillary incisors accounts for about 37%; this is because of their anterior positioning and protrusion caused by the eruptive pattern [6, 7].

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## CASE REPORT

A 27-year-old male was referred from the Department of oral maxillofacial surgery with a mobile fragment of 22 since 2 days following a road traffic accident. He was in pain due to pulp exposure. Pain was dull gnawing type, which increased on chewing hard substances. Clinical examination shows revealed mobile fractured fragment with sulcular bleeding irt left maxillary lateral incisor although it looks apparently normal. radiographic examination revealed a complicated oblique fracture that was extending subgingivally in the palatal aspect. Periodontal ligament space was intact and no root fracture was seen in relation to 22 (Figs 1 -2). ; the root formation was complete with no extrusion of the tooth ,no associated alveolar injuries.

**Provisional Diagnosis:** complicated crown root fracture of 22. medical history was non- contributory. after discussing various treatment options with the patient i.e, reattachment of the tooth fragment or removal of the fractured segment followed by restoration with post and core and placement of crown. patient agreed with conservative approach. informed consent was taken.

local anesthesia was administered (1.0 cc of lidocaine 2% with 1:80,000 epinephrine) and an mobile coronal fragment removed(fig -3) and was stored in saline(fig -4). access opening was done irt 22(fig-5). pulp tissue was extirpated and copious irrigation with sodium hypochlorite followed by saline rinse (passive irrigation). working length determination done with root zx apex locator and confirmed with radiograph(fig -6). biomechanical preparation by stepback technique, with master file being 45k- file, canal was dried with paper points and obturated with lateral condensation technique using gutta percha(fig -7). laser gingivectomy was performed since the lingual margins were located subgingivally in relation to 22 and also to attain complete hemostasis(fig -8). Styptics was also used for hemostasis(fig -9). Post space was prepared using peeso reamers of sizes 1, 2, and 3. A fiberreinforced post of size 2 (Angelus, REFORPOST, Londrina, Brazil) was selected and the length of the post was adjusted so that 2 mm was extending coronally to the fractured segment(fig- 10). The prepared post space was conditioned and adhesive application was done on fiber post, post space, and tooth fragments. The dual-cure resin luting cement was injected into the post space and the fiber post. post was luted into the post space following which, light-curing was done (Fig. 6). Thetooth fragments and tooth surface were etched and a bonding agent was applied. Tooth fragments were then attached using resin cement and were cured (Fig. 11). At 1-week recall stability of the fragment was checked followed by radiographic assessment(fig-12). Patient was further recalled after, 3 weeks, 3 months, and 6 months for evaluation and was asymptomatic. The patient was kept on periodic review and it was observed that both endodontic and restorative treatments remained clinically acceptable through each visit. The clinical and radiographic pictures after 6 months were satisfactory.



Fig 1 clinical examination



Fig 2 radiographic examination



Fig 3 Mobile Coronal Fragment



Fig 4 Coronal Fragment Stored in saline



Fig 5 access cavity preparation, pulp tissue was extirpated



Fig 9 after gingivectomy, hemostasis attained using styptics and laser.

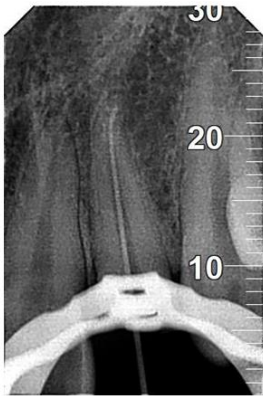


Fig 6 working length determined

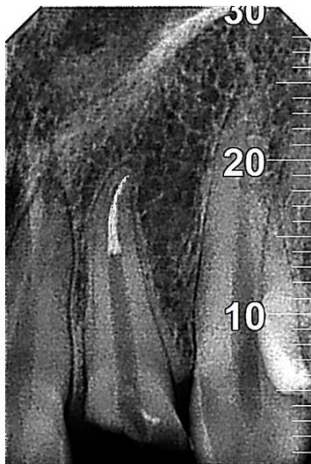


Fig 7 post space preparation with peeso-reamers



Fig 10 post is luted to the coronal fragment



Fig 11 after attachment coronal fragment

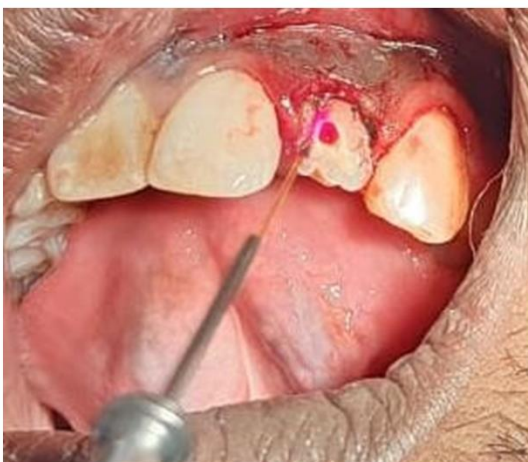


Fig 8 gingivectomy was done in the labial aspect of 22 to expose the margin with diode laser

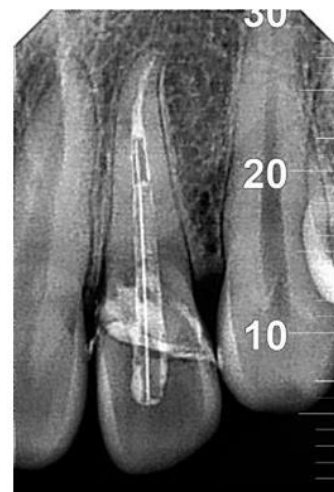


Fig 12 post-operative radiograph after 1 week

## DISCUSSION

This was a case of complicated crown-root fracture, which involves enamel, dentin, pulp, and cementum, extending below the gingival margin. As the fractured coronal segment of the tooth was intact, fragment reattachment was considered. Complicated and uncomplicated crown-root fractures posed

greater difficulties due to the multi-disciplinary approach necessary for their management [11]. Hence, an evidence-based, uniform intervention strategy is necessary [12]. Thus, the International Association of Dental Traumatology (IADT), in 2020, suggested updated guidelines for improved management of injured teeth and to minimize complications resulting from trauma.

These guidelines have been summarized.

Type of fracture	Extent of fracture	Tissues involved	Treatment approach
Uncomplicated injuries	Crown fracture	Enamel only	Reattach the fragment back to the tooth after rehydration by soaking in water or saline for 20 min, before bonding
		Enamel-dentin only	Cover the exposed dentin with glass-ionomer/bonding agent and composite resin If the exposed dentin is within 0.5 mm of the pulp place a Ca(OH) <sub>2</sub> lining and cover with glass-ionomer Reattach the fragment after rehydration
	Crown-root fracture	Enamel, dentin & cementum	Until a treatment plan is finalized, stabilize the loose fragment to the adjacent tooth/teeth temporarily or to the non-mobile fragment If the pulp is not exposed, removal of the coronal or mobile fragment and subsequent restoration should be considered Cover the exposed dentin with glass-ionomer or use a bonding agent and composite resin Root canal treatment and restoration, if the pulp is non-vital Reattach the fragment after rehydration
Complicated injuries	Crown fracture	Enamel, dentin & pulp	Conservative pulpal therapy (partial pulpotomy) with non-setting Ca(OH) <sub>2</sub> or non-setting calcium silicate cement for mature and immature permanent teeth If a post is required for crown retention in a mature tooth, root canal treatment is followed by reattachment of a rehydrated fragment [13] (Figure 1)
	Crown-root fracture	Enamel, dentin, cementum and pulp	Treatment is similar to uncomplicated crown-root fractures If the fracture extends the biologic width, a gingivectomy [14], flap surgery combined with osteoplasty/osteotomy procedures is required, prior to reattachment [15,16]

In the pre-adhesive era, fractured teeth needed to be restored with conventional pin retained or cast post restoration that sacrificed healthy tooth structure followed by metal ceramic crown and were a challenge for the clinicians to match with the adjacent teeth both esthetically and functionally. Major disadvantage was metal posts often cause catastrophic root fracture owing to higher modulus than dentin. Thus leads to nonhomogenous and dangerous stresses in root dentin.

In the era of contemporary adhesive dentistry fiber post with adhesive system has got several advantages in the management of badly broken down tooth. They are more Aesthetic, well bonds to tooth structure, Modulus of elasticity or stiffness is similar to that of dentin (18 Gpa), Uniform distribution of stress and hence less chances of fracture and creation of a mono-block, a multilayered structure with no inherent weak interlayer interfaces in maintaining the integrity of final endodontic-restorative continuum [1].

Follow up- Any traumatized tooth/teeth should be followed up as per the IADT 2020 guidelines at 1 week, 6-8 weeks, 3 months, 6 months, 1 year and yearly for 5 years according to the type of injury. Follow up of the patient, whenever possible, should always be accompanied with radiographs annually for the first two years and then biennially until the 5 year follow up is completed.

Photographic documentation should be maintained at each of the follow-ups for aesthetic reevaluation.

Outcome of treatment depends on majorly some factors such as Time elapsed/ treatment delay, Type of injury, Rehydration of fragment and Tooth preparation.

**Time Elapsed/ Treatment Delay-** According to Andersen *et al* treatment delay can be categorized into Acute(<3h),

Subacute(<24h), Delay(>24h). In complicated crown- or crown root fractures, a subacute or delayed treatment is acceptable. Treatment delay would also lead to longer dry time of the fractured fragment. The final bond strength of the restored tooth is drastically less when the fragment is dehydrated (up to 48h) as compared to a hydrated fragment. Some of this diminished bond strength is returned when the fragment is rehydrated before reattachment or if the dentin is removed from the fragment before restoration.

**Type Of Injury** - One year clinical survival rate of teeth restored with fragment reattachment in uncomplicated and complicated fracture were 95.7% and 90.0%, respectively. However crown fractures associated with luxation injuries have shown adverse outcomes 8 times higher than the non-luxation injuries.

**Rehydration of Fractured Fragment-** The success of fragment reattachment procedure depends on the adequate rehydration of the tooth fragment. Dehydration of the fragment results in collapse of the collagen fibres resulting in insufficient resin monomer penetration and hence reduction in the bond strength values. Hence, for a successful rehydration procedure fragment must be rehydrated for at least thirty minutes prior to reattachment procedure.

**Tooth Preparation-** The bond strength of reattachment procedure is not dependent only on the technique but also influenced by the hydration of the fragment and adhesive material used. Thus it is suggested that as long as the fragment adapted well with the tooth structure, tooth preparation should be avoided and only adhesive- reattachment, Using an adhesive is advocated.

## CONCLUSION

Fragment Reattachment procedure can provide favorable and long-lasting esthetics because the tooth's original anatomic form, color, and surface texture are maintained.

Reattachment is a relatively simple procedure which restores function, provides a positive psychological response.

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