



RESEARCH ARTICLE

MANAGEMENT OF FRACTURED ANTERIOR TEETH BY BIOLOGICAL RESTORATION: AN UNTRA CONSERVATIVE APPROACH

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ABSTRACT

Fracture of anterior teeth specially maxillary incisors is relatively common occurrence in children & adolescences. There are various treatment modalities of management of fractured anterior teeth. Factors determining the treatment plan and prognosis for teeth fractures include the extent of fracture, endodontic involvement, periodontal status, maturity of root, presence or absence of fractured tooth fragment, occlusion, finances etc. One of the excellent mode of treatment of crown fracture is biological restoration. When the fractured fragment of patient's own tooth is reattached called autogenous bonding but when the fracture fragment of patient's tooth is not available, segment of an extracted tooth from tooth bank can be used, it refers to homogenous tooth bonding. The present case report describes the successful management of fractured upper anterior teeth using both homogenous tooth bonding (in case of Ellis class II fracture in 11) & autogenous tooth fracture reattachment with the help of fiber post after completion of endodontic treatment (in case of Ellis class III fracture in 21). At 3 months follow up, the restoration revealed good aesthetic, functional & psychosocial results.

INTRODUCTION

Trauma to the anterior teeth is relatively a common occurrence that mainly affects children and adolescents between 2 to 3 years & 7 to 12 years of age respectively. It is more common in males than in female because of their active involvement in extracurricular activities. The Maxillary incisors are most commonly affected because of their anterior position and protrusion caused by eruptive pattern. Trauma to the anterior teeth requires immediate attention not only because of the damage caused to the dentition but also due to the psychological impact it has on the patient. Primary goal of the treatment of traumatically injured teeth is pain & infection control, esthetic and functional rehabilitation. Various methods and techniques were employed to restore fractured teeth which include-direct resin based composite restoration, tooth fragment rebonding, porcelain jacket crowns and ceramic crown, root canal treatment and crown with or without post and core, extraction followed by replacement (Yadav and Shetty, 2013). Restoration using natural tooth fragment is known as "Biological Restoration". The expression "biological restoration" was coined in 1991 by Santos and Bianchi. When the fractured fragment of the patient's own tooth is reattached,

it is referred to as autogenous bonding while homogenous bonding refers to the use of extracted donor teeth to prepare crowns or posts (Mittal, 2014). Rebonding of the fractured fragment should be considered only in cases where there is no or minimal violation of biological width and the fragment is retrieved in a relatively intact condition. When the patient doesn't present with the fractured fragment or its use is not recommended, donated extracted teeth can be used for reattachment procedure after following strict sterilization protocol and consent from both recipient & donor. The present case report describes the successful management of fractured upper anterior teeth using both homogenous (in case of Ellis class II fracture in 11) & autogenous bonding technique after completion of endodontic treatment (in case of Ellis class III fracture in 21).

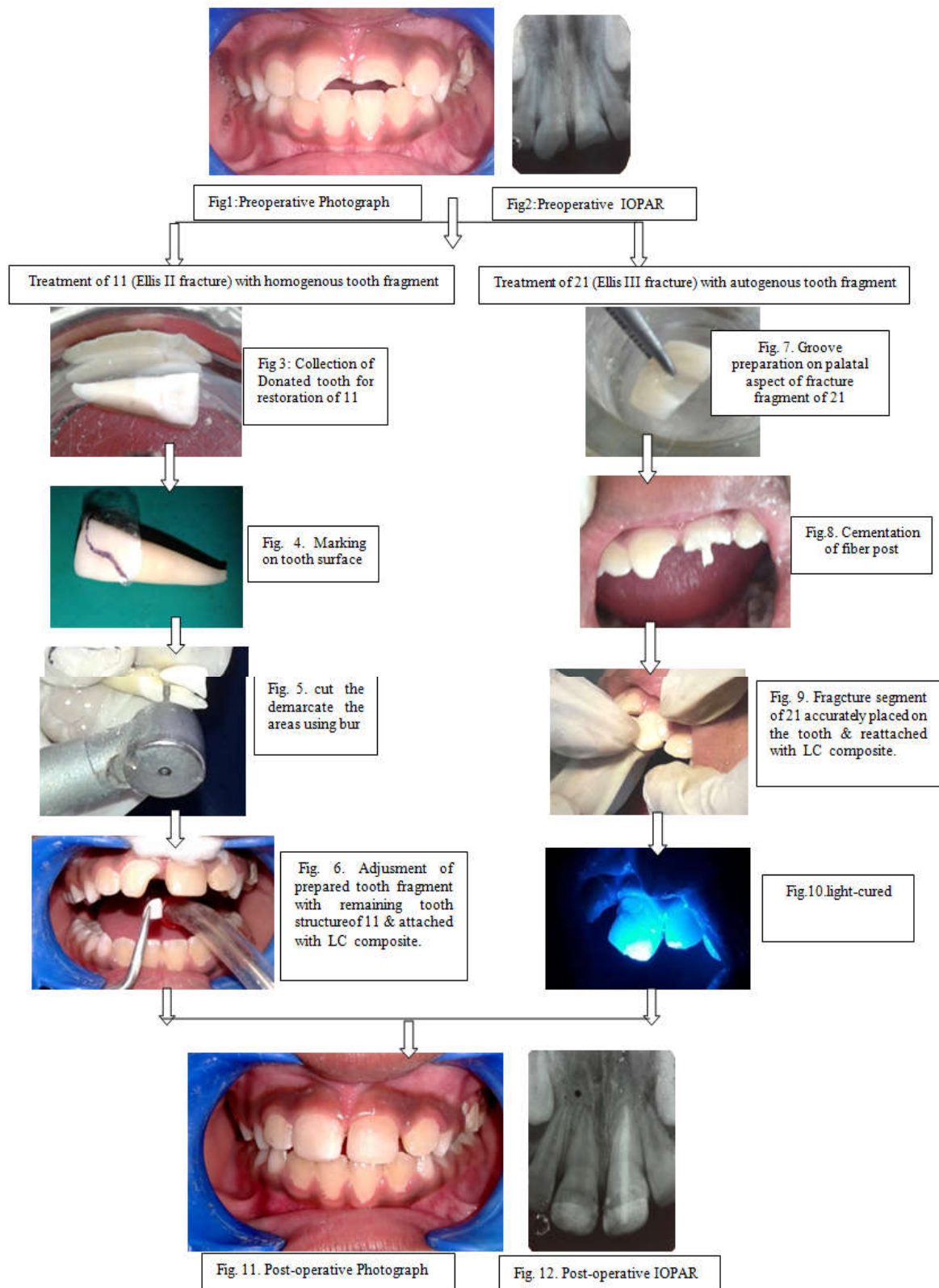
CASE REPORT

A 12-year-old female patient reported to the Department of Pedodontics and Preventive Dentistry, GNIDSR, Kolkata, India, with the chief complaint of pain & broken tooth in upper front tooth region due to trauma during sports activity two days back. The patient's medical history was non-contributory. Clinical examination revealed that Ellis class-II fracture in 11 & Ellis Class-III fracture in 21 (Fig1). Pulp vitality test in 11 & 21 with Electric Pulp Tester (Parkell Digitest II) revealed 11 to be vital & 21 to be non-vital.

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Pictorial Flow Chart of Case



The fractured fragment of one tooth (21) was recovered by the parent at the site of injury and brought to the clinic stored in normal saline. But the fractured fragment of 11 was missing. Radiographic examination (IOPAR) revealed no associated root & alveolar bone fracture and periapical area appeared normal (Fig 2). Upon examination of the fractured fragment, it was found that the fragment was in healthy condition and it fit reasonably well on the tooth (21).

Treatment Plan was to attach fracture tooth fragment using autogenous bonding after completion of endodontic treatment with the help of fiber post in 21 & homogenous bonding in 11 with a donor tooth fragment. Before treatment procedure ethical clearance was taken from the Ethical committee of GNIDSR. The treatment plan was explained to the patient and the consent was taken from both donor & recipient. Autogenous & homogeneous tooth fragment, sterilized by

immersing in 0.9 N NaOH for 2 hours and then autoclaving at 121°C for 15 minutes. The fractured segment was stored in physiological saline solution in order to prevent dehydration and discoloration of the tooth fragment (Mittal, 2014).

Management of fractured left upper Maxillary central incisor (21)

Under Local anesthesia access cavity was prepared on 21. Working length was determined with the help of radiograph followed by the biomechanical preparation and obturated with gutta percha (Dentply) using lateral condensation technique. After 24 hrs, the root canal was prepared for the post placement by removing the gutta percha from the coronal two-thirds of the canal with peeso reamers. After trial fit of fiber-post (Coltene), it was cemented in the canal with flowable composite (Ivoclar Vivadent) & trimmed leaving about 3 mm of the post beyond the tooth (Fig8). Internal groove was prepared palatal surface of autogenous fractured segments using a straight fissure bur and hence it would fit over the 3 mm of the post (Fig7). The fractured segment was then accurately placed to its original position on the post, paying special attention to obtain a lock and key type of fit between the segments & fiber-post (Fig9). Both fractured fragment and tooth-surfaces were etched with 37% phosphoric acid and bonded. After reestablishing original position, autogenous tooth fragment was cemented with remaining fracture tooth using flowable composite (Fig 10). The margins were properly finished with diamond burs & bite checked.

Management of fractured Right upper Maxillary central incisor (11)

Single rooted tooth of similar shape and size to damaged tooth (11) was selected from oral & maxillofacial surgery for preparation of homogenous donor tooth fragment after matching shade of recipient tooth (Fig 3). The tooth was cleaned of soft tissue tags and periodontal remnant. Impressions of maxillary and mandibular arch of the patient were made with silicon impression material for fabricating casts required for restoration adjustment. Mesio-distal, cervico-occlusal and bucco-lingual dimensions of the tooth were measured using a caliper. Articulating paper was then used to demarcate the areas that needed further adjustments (Fig 4). Coronal part of the donor tooth was cut with bur according to the shape and size of fractured tooth & adjustment was done on maxillary cast (Fig 5). Fragment was intentionally kept a little larger than the required size to provide for the final adjustments needed to be done inside patient's mouth (Fig6). Acid etching of the cut tooth fragment as well as the remaining fractured tooth was carried out. Bonding agent (Ivoclar Vivadent) was applied on fractured tooth and the prepared tooth fragment and cured. Flowable light cure Composite (Ivoclar Vivadent) was applied to both fragment and tooth-surfaces. The fragment was held in its proper position and the adhesive resin was light cured from both sides. Finishing and polishing was done using diamond burs and sandpaper disks of different granulations & the occlusion was carefully checked (Fig11). The patient was instructed to avoid exerting heavy function on this tooth and to follow regular home care procedures relative to oral hygiene. The patient was informed that the reattachment line might be visible, and, if necessary, this could be managed in future visits. Patient was kept on follow up for 3 month intervals.

DISCUSSION

Management of anterior tooth fracture has been one of the most important aspects of Dentistry. Management of tooth fracture depend upon several factors: the extent of fracture (biological width violation, endodontic involvement, alveolar bone fracture), pattern of fracture (associated root fracture), secondary trauma injuries (soft tissue status), presence or absence of fractured tooth fragment and its condition for use (fit between fragment and the remaining tooth structure), occlusion, esthetics, finances, and prognosis (Arnaout, 2014). One of the mode of management of crown fracture is reattachment of fracture fragment. Biological restoration provides an excellent mode of restoring fractured teeth. The first case of reattaching a fractured incisor fragment was reported in 1964 by Chosack A et al., Tennery, Starkey and Simonsen were the early workers to report the cases of "tooth fragment reattachment" (Jagannath-Torvi and Kala, 2014). But the success of the tooth fragment reattachment depends on several factors- one of them is hydration of the fractured segment while outside the oral cavity. Improper storage can lead to dehydration and discoloration of fractured fragments. The fracture fragment should kept in a medium such as physiologic saline. According to Toshihiro and Rintaro, (Kaushik *et al.*, 2016) even though the fractured fragment that was reattached was dehydrated, the fragment recovered its original color and translucency without any marked change. In this case fracture tooth fragment of 21 was kept in normal saline since 2 days.

Most commonly recommended technique is autogenous or homogenous fragment bonding. Fragment bonding is a procedure that can be labeled as "biological restoration," consisting of the use of fragments of the fractured tooth (autogenous bonding) or fragments obtained from an extracted tooth (homogenous bonding). Tooth banks, providing donor teeth for biological restorations, are part of non-profit institutions generally integrated into teaching or research institutions. The donated teeth are stored in distilled water under refrigeration. Before manipulation, the teeth are properly cleaned, stored, and sterilized by soaking in sodium hydroxide (NaOH), 0.09 N or 0.9 N, for 2 hours and autoclaved at 121°C for 1 hour ensuring all biosecurity standards (Mittal *et al.*, 2014). When the remainder of the tooth is not sufficient to retain the fragment or the restorative material, it is necessary to use additional resources for retention. The use of the glass-fiber post is a favorable option for the retention of the fractured segment. Zorba and Ozcan (Kaushik *et al.*, 2016) used a fiber-reinforced post to increase retention of the reattached crown fragment. Fiber post was preferred over a metallic post because they have better esthetics, their modulus of elasticity is similar to that of root dentine. This results in less stress concentration on the root and thus low incidence of root fracture. In this case, a fiber post used into the pulp space of the coronal fragment for auxiliary retention.

Autogenous and homogenous tooth reattachment offers several advantages over other techniques used for restoring fractured teeth. It is a conservative and an immediate restorative procedure. It offers the advantage of good and long lasting esthetics because the tooth's original anatomical form, color, translucency and surface texture are maintained. It also provides color stability over time and the rate of wear is similar to other natural teeth. It also restores the function and has a

positive emotional and psychological response from the patient due to the preservation of natural tooth structure. The clinical procedure is safe and simple; therefore, requiring less chairside time, which might reduce the cost of the treatment. Disadvantages of the autogenous tooth bonding technique is dehydration and discoloration and disadvantage of the homogenous tooth bonding technique is the difficulty in obtaining teeth with the required coronal dimensions and characteristics, problems inherent to indirect restorations and matching fragment color with that of fractured tooth. Also, having fragments from other people's teeth in their mouth is not a pleasant idea for some patients and many of them refuse to receive this treatment. In the present case, ethical committee clearance, parental consent, secure methods of sterilization and storage are provided to ensure safety in using teeth or tooth fragments.

Conclusion

The technique of biological restoration is simple, less time consuming, reduce the cost of the treatment, allows the preservation of sound tooth structure and provides natural look compared to composite resins and ceramic crowns, especially regarding translucency. It offers excellent esthetic, functional and psychosocial results. The present case of teeth fracture was managed by biological restoration which is an effective treatment alternative in restorative dentistry as it fulfills all three FDI criteria for evaluation of restoration, i.e, aesthetic, functional and biological aspects.

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