CASE REPORT

TOOTH FRAGMENT RE-ATTACHMENT: A Biological Approach

ABSTRACT:

Coronal fractures of the anterior teeth are more prevalent in young children and teenagers. The use of dental adhesive materials to re-attach tooth fragment seems to be a feasible treatment option and has several advantages, including the restoration of function, aesthetics, shape, texture, and brightness of the surface. This case report presents 8-year-old child with Ellis class II fracture in right maxillary central incisor with open apex reported to the department along with tooth fragment. Indirect pulp capping with MTA in the prepared slot along with tooth fragment re-attachment was performed by doing etching and bonding only on enamel surface. On 3rd month and 6th month follow up, the re-attached fragment were evaluated clinically and radiographically which showed good success. Tooth was vital when performed electric pulp testing and thermal test. There was no color changes in the re-attached fragment had good appearance and root-end development was evident.

Keywords: Indirect pulp capping, Biological restoration, MTA, Fragment re-attached.

INTRODUCTION:

Coronal fractures of the anterior teeth are the most common type of dental injury, affecting primarily children and teenagers.[1] The majority of dental injuries occur particularly between the ages of 2 to 3 years and 8 to 12 years; they are more common in boys than in girls because of their active involvement in extra-curricular activity.[2] The most commonly involved tooth due to trauma are maxillary central incisor due to anterior position and labial proclination of tooth in the arch. Uncomplicated crown fractures are those involving only enamel and dentin accounts which is about 28 % to 44 % of children's traumatised teeth.[3]

Today, restoration of such traumatized incisors by re-attachment of the original tooth fragment appears to be the most conservative treatment approach. Reattachment of fractured fragment has various advantages over other restorative procedures (composite restorations, laminate veneers, post and core, and so on), including enhanced aesthetics and function.[4] The advantages of tooth fragment bonding, including as anatomical traits, color, and surface appearance, that have made it popular. Reattachment of fractured tooth fragment enhances durability since the wear of the fracture fragment is same as that of the natural tooth without fracture.[5] It has the potential to produce a pleasant psychological response as well as long-lasting aesthetics. Bonding is one of the easiest and least expensive operations, and some dentists consider it to be the greatest way to restore tooth.[6]

Mineral Trioxide Aggregate (MTA) has been one of the most widely utilized endodontic materials for indirect pulp capping, apexification, apexogenesis external root resorption, and obturation of retained primary teeth over the years. It has been shown to have biocompatibility, bioactivity, hydrophilicity, radiopacity, sealing ability. Biocompatibility is important because it promotes appropriate healing responses. The material is non-absorbable, sets when exposed to moisture, has a high compressive strength, and maintains a high alkaline

pH throughout time. Unlike calcium hydroxide MTA on the other hand, has a very low solubility and retains its physical integrity even after placement.[7] As a result, MTA was utilized as indirect pulp capping agent.

The purpose of this case report is to present tooth fragment attachment after indirect pulp capping of uncomplicated crown fracture. The case report describes the bonding of a tooth fragment in 8-year-old boy.

CASE REPORT:

8-year old boy reported to the department with trauma to anterior tooth due to the fall on the floor, and he reported in 30 minutes to the department after trauma. The medical history of the patient was not significant. His father recovered the tooth fragments from the incident site. On extra-oral examination, no laceration or trauma to soft tissue was noticed. On intra-oral examination, simple crown fracture of the maxillary right central incisor upto middle third of the crown was noted with pink translucent hue (Figure 1 & 2) and he complained of teeth sensitivity when exposed to air and drinking. On radiographic examination, open apex (Nolla's stage 8) without any root fracture and mesiodens with respect to 21 was noted (Figure 3).

On examination of the fragment, it was in good condition and there was no fracture of enamel and dentin noted and seated well on the fractured tooth (Figure 4). The possibility of reattaching the same teeth fragments along with indirect pulp capping with MTA was explained to the patient's father and written consent was obtained.

After local anesthesia administration, the alignment of the fragment segment was verified. Round bur was used to create a slot in the dentin of the fractured fragment to a depth 1 mm and width of 2 mm (Figure 5) followed by placement of MTA (Angelus: Blanco) on

the slot area and allowed to set for 15 mins with a wet cotton pellet over it (Figure 6). Both the fragment and the fractured tooth was then acid etched with 37% phosphoric acid (Ivoclar Vivadent AG, Schaan/Liechtenstein) for 30 seconds and thoroughly rinsed off. A universal adhesive (Single Bond 3M ESPE] was applied only on the enamel of the tooth fragments and fractured tooth and light cured for 15 seconds and a flowable resin (Tetric Flow, Ivoclar Vivadent AG, Schaan/Liechtenstein) was applied in the enamel of the fractured fragment and fractured tooth. Occlusion was verified and post-operative instruction was given to avoid any hard food or occlusal load (Figure 7). After the procedure, surgical removal of mesiodens was performed in # 21 on the same visit. Clinical and radiographic examinations were carried out in 1st month, 3rd month and 6th month after treatment. Vitality of pulp was determined by a pulp sensibility test using electric pulp testing and sensitivity using thermal test in the 1st month follow-up visit. The findings were positive, and the tooth was functioning normally.

After 3rd month and 6th months follow-up clinical and radiographic examination was done which showed functionally normal and esthetic was pleasing with no difference in the shade. Radiographically almost root end closure was noted (Figure 8,9,10 & 11) with no periapical pathology.

DISCUSSION

Dental trauma is a serious public health issue due to its prevalence, economic effect, and influence on psychological well-being of the patient, thus requiring quick and simple restorative treatment.[8] Tooth fragment re-attachment was once used as provisional restorations has now gained as a permanent solution due to the advancement in the adhesive system. The recent development in the restorative material placement techniques and designs enables us to restore the fracture fragment more precisely.[9] The present case report showed longevity for more than 6th month with physiological root end development.

However, there are various factors which denotes the survival of the tooth fragment such as extra preparation of the fractured fragment and the remaining tooth structure to enhance the bonding of the fractured fragment to the remaining tooth. In the present case, extra preparation with bevel and internal dentinal grooves enhances the longevity of the restoration. After 6th month follow-up, the patient's outcomes were determined to be both aesthetically and functionally satisfactory. Bruke et. al [10] had employed a combination of an internal dentin groove and circumferential beveling of enamel margins was found to be successful. Other additional preparation such as placing a chamfer at the fracture line after bonding, using a V-shaped enamel notch, and placing an internal groove or a superficial over-contour over the fracture line are that have been used by different clinicians to improve adhesion between the fractured and the remaining segment.[11]

Simonsen et.al[12] in 1979 has employed a following four justifications for employing a circumferential bevel for reattachments such as it eliminates cracked enamel prisms and surface enamel, resin-enamel lap joint is possible, it serves as a finish line and enamel prisms are arranged in "end-on" relationship. He also proposed removing dentin from the fragment to make room for calcium hydroxide to be placed in the exposed dentinal and/or pulpal areas and to enhance the quantity of internal enamel available for etching. In the present case MTA was placed in the slot prepared in the fractured fragments as it induces the production of mineralized tissue, according to specific literature, and recent studies have administered MTA directly to exposed pulp tissue in direct capping or pulpotomy, resulting in dentin bridges and no inflammatory response. The formation of dentin bridge is the most important predictor of success in direct pulp capping or pulpotomies.[7] Bonding agent was applied only on the enamel both of the fragment and fractured tooth. A thin layer of flowable composite was placed only on enamel so that functioning of MTA as indirect-pulp capping agent will not be compromised and maintain a contact with the tooth.

Rehydrating of the tooth fragment in storage media has been reported to be factor in the survival of re-attached tooth and also in getting the translucency back to that of the natural teeth. A study conducted on one hundred and eighty traumatized mandibular incisors showed that 24-hours rehydrating specimens showed stronger bonding in comparing with 30-minutes rehydrated specimen[9]. However, in the present case patient reported immediately after trauma and the fragment was stored in normal saline media.

For bonding the fractured anterior teeth, composite resin restoration with the use of the acid etch technique is believed to be a very aesthetic procedure. Despite the absence of hydroxyapatite crystals, dentin tubules, or enamel rods in composite resins, secondary optical qualities including as translucency, opacity, opalescence, iridescence, fluorescence, and surface gloss are still present[13]. However there is no synthetic restorative material that can match the natural tooth structure's aesthetic characteristics or colour stability. According to the evidence found in the studies included in this review, simple tooth fragment reattachment was the preferred reattachment technique. An increase in the bond strength between tooth fragment and dentin was observed when an intermediate material was used.[13, 14]

Furthermore, the opposing dentition will abrade composite resin faster than enamel. When a broken tooth fragment is reattached, however, the rate of wear and abrasiveness is the same as when the tooth is entire[15]. Furthermore, the treatment technique takes less time, which reduces the treatment cost. The reattached fragments at the 1st month, 3rd month and 6th month follow-up showed clinically and radiographically good success, colour harmony was achieved and the teeth were still functional with no colour change.

CONCLUSION

With the advancement in the restorative materials and following a proper procedure protocol aesthetic effects can be obtained with predictable results. Reattaching a tooth

fragment is a viable treatment for restoring function and aesthetics with a relatively conservative approach if fractured fragment is available. However, longevity has to be evaluated with long term follow-up for vitality and fragment retention.

Consent

As per international standard or university parental(s) written consent has been collected and preserved by the author(s).

Ethical Approval:
As per international standard or university standard written ethical approval has been collected and preserved by the author(s).

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LIST OF FIGURES

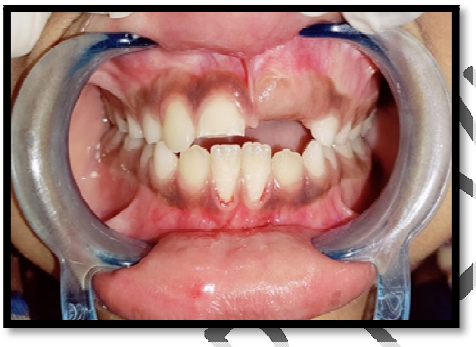

Figure 1: Frontal view of fractured 11

Figure 2: Occlusal view of the fractured tooth 11

Figure 3: Pre-operative IOPAR showing open apex (Nolla stage 8)in 11 and with mesiodens

Figure 4: Fracture fragment after cleaning

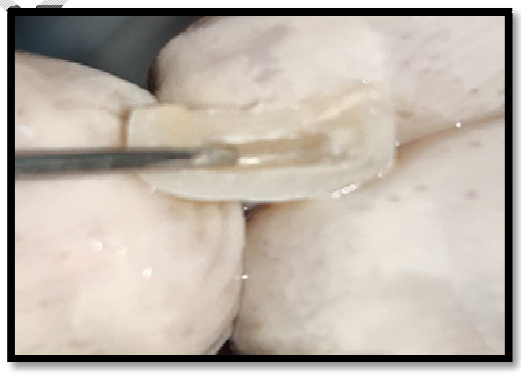

Figure 5: Slot preparation in the fracture fragment (1 mm x 2 mm)

Figure 6: MTA placed in the slot prepared

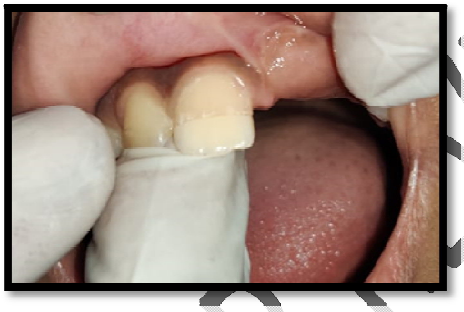

Figure 7:Fracture fragment re-attached to the tooth structure 11

Figure 8: Post-operative IOPAR showing root end development at 3 month follow-up

Figure 9:Post-operative 6 month follow-up IOPAR showing almost root end closure (Nolla stage 9)

Figure 10: Post –operative 6 month follow-up