Fracture reattachment in an immature permanent incisor with talon’s cusp. A rare case report

ABSTRACT

**Aim** To report the successful and conservative management of a fractured immature permanent maxillary incisor tooth with talon cusp by fracture reattachment.

**Summary** Coronal fractures of the maxillary anterior teeth are common dental injuries. Among these, the complicated fractures especially in immature teeth require an unambiguous treatment without any delay. When the tooth fragment is available and there is no (or minimal) violation of the biological width, reattachment is the preferable choice. It is a conservative procedure in which the original anatomic form, color, tooth contour, surface texture and aesthetics are preserved. The prognosis of this procedure depends on the patient’s cooperation, good understanding about the treatment limitations and periodic follow up. This report emphasises the management of coronal fracture in immature teeth by reattachment.

**Keywords** Aesthetics; Crown fracture; Cvek’s pulpotomy; Talon cusp.

Introduction

Traumas such as those secondary to car and sports injuries result in multiple tooth injuries, though dental trauma mostly involve only a single tooth [Andreasen et al., 1994; Macedo GV et al., 2008]. High ratios of these dental injuries involve the anterior teeth, especially the maxillary incisors, whereas the mandibular central incisors and the maxillary lateral incisors are less frequently involved. Among the coronal fractures, maxillary teeth are the most prevalent to be involved [Hamilton et al., 1997; Dietschi et al., 2000; Chu et al., 2000].

Esthetic management of these crown fractures is one of the greatest challenges to the dentist [Simonsen, 1982], as the present generations are very conscious about their appearance and demand immediate treatment and aesthetic rehabilitation. Several factors influence the management of coronal fractures, including the extent of fracture (to check the biological width violation, endodontic involvement, alveolar bone fracture), pattern of fracture and restorability of fractured tooth (associated root fracture), secondary trauma injuries (soft tissue status), presence or absence of tooth fragment and its state for use (fit between fragment and the remaining tooth structure), occlusion, aesthetics, prognosis and cost [Andreasen et al., 1995; Chu et al., 2000; Olsburgh et al., 2002; Reis et al., 2001; Strassler et al., 1995].

The conventional approach for rehabilitation of fractured anterior teeth includes composite restoration, post-supported prosthetic restoration and in some cases extraction followed by fixed prosthesis [Baratieri and Monterio, 1990; Trushkowsky, 1998]. With the introduction of improved technologies, newer generations of composite resins and wet bonding agents many innovative techniques have been evolved.

Talon’s cusp is an infrequent dental anomaly in which an accessory cusp-like structure projects from the cingulum area or cementoenamel junction of the maxillary or mandibular anterior teeth in both primary and permanent dentitions [Davis and Brook, 1986; Hattab et al., 1996; Mellor and Ripa, 1970; Mader, 1981]. According to Al-Omari et al. [1999], a talon’s cusp is not an innocuous defect, because of its significant diagnosis, treatment planning and procedural difficulties. Early diagnosis and management are essential to avoid complications. Talon’s cusp was first documented by Mitchell in 1892 [Reis A et al., 2001]. Though exact aetiology of this anomaly remains unknown, it is believed to develop due to an interaction between the ectoderm and mesoderm of epithelial bulgings present on the premaxillary region at the time of complex odontogenesis. It is composed of normal enamel, dentin and varying extensions of pulp tissue [Simonsen RJ, 1982; Andreasen FM et al., 1995; Olsburgh S et al., 2002; Reis A et al., 2001; Jawharji N et al., 1992; Natkin E et al., 1983; Shafer WG et al., 1993]. Shay reported that the pulp tissue can extend to the center of the tubercle and, once fractured, the pulp is exposed [Shay & Jing-Chuan 1984].

According to the literature there is no report of traumatic dental injury in teeth with talon cusp. This article reports on the management of a complicated
coronal fracture in an immature tooth with talon cusp by using Cvek’s pulpotomy and fragment reattachment.

Case report

A 9 year old boy came to the Specialty Dental Centre of Chennai (India) with a fractured front tooth. The patient’s mother stated that the boy had a fall three hours back while playing. The parents had brought the broken fragment along with them. After the routine investigations of dental trauma, the intraoral examination was done. It revealed that the patient had undergone a complicated oblique crown fracture of the left upper central incisor (Fig. 1). No mobility of the injured tooth was recorded and the surrounding tissues were healthy. Both the maxillary incisors were present, with enlarged or prominent cingula (trace talons) with no evidence of any lesion, caries or interference with occlusion and hence not troublesome to the patient.

A periapical radiograph showed that the root formation was incomplete (roots of 11, 21 were in Nolla’s stage 9 i.e, open apex and almost two thirds of root completed) with no signs of luxative injuries (Fig. 2). After confirming that the fragment was in good condition and that it also fit reasonably well on the fractured tooth, the reattachment option was suggested to the patient. Since the patient was much concerned about aesthetics, this treatment plan was accepted. We decided to perform Cvek’s pulpotomy, so that only the coronal pulp was removed and, thus, aesthetics was not much affected.

The tooth fragment was stored in saline solution until the preparatory procedures were completed (Fig. 3).

Local anaesthesia was administered and the operating field was isolated with rubber dam (Fig. 4). From the exposure site, 2 to 3 mm depth of the pulp tissue was completely removed and cleaned with saline. Care was taken to remove the remnant pulp tissue of the talon cusp tubercle. Once haemostasis was achieved with the placement of wet cotton pellet (Fig. 4), a layer of calcium hydroxide was placed. The entrance of the root canal was sealed with Dycal® (Dentsply, USA) (Fig. 5). The pulp chamber, dentin, and enamel were etched with a 37% phosphoric acid gel, rinsed with water, and then coated with an ethanol-based adhesive system (Adper Single Bond Plus, 3M ESPE) and light-cured. Simultaneously, the fractured surface of the fragment was also etched (Fig. 6). The same adhesive system was then applied to the etched surface. The coronal tooth fragment was secured by an “orthodontic bracket holder” in order to facilitate handling. Flowable composite resin (3M ESPE) was applied to both the fragment and the tooth surface and special attention was given in order to maintain an accurate fit. When the original position was reestablished, excess resin was removed and light curing was done for 40 seconds on each surface, making sure that no displacement of the fragment occurred before...
Fracture reattachment in immature teeth

The complete polymerisation.

The margins were properly finished with diamond burs and polished with a series of Sof-Lex disks (3M ESPE) and diamond polishing paste (Fig. 7).

The lingual projection of the talon’s cusp was carefully checked and adjusted. The patient was instructed to avoid exerting heavy function on the tooth and to follow regular oral hygiene procedures. A mouthguard was given to the patient as a precautionary measure.

The patient returned for 1, 3, 6, and 12 month follow-ups, and it was observed that both endodontic and restorative treatments remained clinically acceptable for the entire time. Although the reattachment line could be noted in a close-up view, the patient was satisfied with the results and did not want any further treatment. Radiographs clearly revealed the normal apical root closure of tooth 21 (Fig. 8, 9, 10).

Discussion

Talon’s cusp may cause clinical complications. Though Stewart et al. [1978], divided the treatment of dens evaginatus into those techniques employed on vital or non-vital teeth there are no proper guidelines for this anomaly regarding the type of treatment. It differs with individual cases ranging from selective grinding, prophylactically resorting the grooves to endodontic therapy [Yong, 1974; Hill and Bellis, 1984; Chen, 1984; Shay and Jing-Chuan, 1984; Su, 1992]. If aesthetic appearance is satisfactory and function is within the normal limits, the patients require no treatment at all. In the present case, as there was no significant interference, no further treatment was done.

Among the incisor fractures, almost 80% run from the labial to the lingual aspect with the fracture line proceeding in oblique direction [Reis et al., 2001]. Coronal fractures must be approached in a systematic way to achieve a successful restoration. One of the option for managing coronal tooth fractures is reattachment of the dental fragment especially when there is no violation of the biological width or when this is minimal [Baratieri and Monterio, 1990].

Chosack and Eidelman published the first case report about the reattachment of a fractured incisor fragment in 1964 [Reis et al., 2001]. Many factors have been suggested as influencing the successful reattachment, which include the site of fracture, size of fractured remnants, periodontal status, pulpal involvement, maturity of the root formation, biological width violation, occlusion, time, material used for reattachment, use of post, and prognosis [Andreasen et al., 1995; Reis et al., 2001; Torabinejad, 1995; Olsburgh et al., 2002].

Reattachment of a fragment may offer several advantages, like superior aesthetics, wear resistance similar to that of the adjacent teeth, less time consumption, compatibility, a positive emotional and...
social response from the patient for preservation of natural tooth structure, conservation of remaining tooth material, colour matching, colour stability of enamel, preservation of incisal translucency, maintenance of original tooth contours, and lesser cost [Andreasen et al., 1995; Kanca, 1996; Andreasen et al., 1994; Chu et al., 2000; Macedo et al., 2008].

In reattachment techniques, much concern has been given towards the fracture strength of the restored tooth [Reis et al., 2001; Wadhwani, 2000]. Various authors have suggested multiple strategies for reattaching a tooth fragment [Andreasen et al., 1994; Reis et al., 2001] like preparation of an external chamfer at the fracture line after bonding, use of a V-shaped enamel notch, preparation of an internal groove, leaving a superficial over contour of restorative dentinal and enamel grooves such as simple reattachment using only adhesive systems without additional preparation [Farik et al. 2002; De Santos et al., 2001; Farik and Munksgaard, 1999; Pagliarini et al., 2000; Demarco et al., 2004], simple reattachment using an adhesive system associated with an intermediate material [Demarco et al., 2004; Farik et al., 2002; Reis et al., 2001; Reis et al., 2002; Bruschi-Alonso et al., 2007], enamel beveling before the reattachment [Demarco et al., 2004; Walker, 1996; Worthington, 1999], external chamfer (circumferential or partial) in the fracture line after the reattachment [Andreasen FM et al., 1995; Reis A et al., 2001; Bruschi-Alonso RC et al., 2007; De Santos R et al., 2001], V-shaped internal enamel groove [Simonsen Rj, 1982], internal dentin groove [Andreasen FM et al., 1995; Walker M 1996], overcontour with a thin composite layer [Reis A et al., 2001; Reis A et al., 2002].

Some authors suggested that, in cases of complicated fractures, when endodontic therapy is required, the space provided by the pulp chamber can be used as an inner reinforcement, thus avoiding further preparation of the fractured tooth [Oz IA et al., 2006; De Santos R et al., 2001]. However, in such cases, aesthetics may become an important issue as pulpless teeth will lose part of their translucency. But in this present case, it was performed a Cvek’s pulpotomy, i.e. only the portion of the coronal pulp was removed hence the aesthetics was not much affected. Moreover, the talon cusp projection gave extra retention as its pulpal extension was removed during the pulpotomy and provided additional surface for composite resin.

The most advantageous treatment for traumatised immature teeth with vital pulp is apexogenesis, as it allows continued root development, increase in radicular dentin thickness [Goldman, 1974] and normal apical closure. Though the severity of injury influences the vitality of the pulp, the success mainly depends on the extent of pulpal damage and the healing potential of the involved pulp [Pitt Ford, 1996]. The prevention of bacterial leakage is also a critical factor in the healing of the pulpal and periapical tissue [Pitt Ford, 1996]. Previous investigations of traumatically exposed pulp reported that infection and inflammation do not extend beyond 2 mm during the initial 2 weeks post-trauma [Kakehashi, 1965]. Further recontamination of the pulp was prevented by the placement of calcium hydroxide, which has been demonstrated to provide an adequate seal [Cvek et al., 1982; Torabinejad et al., 1993]. Though mineral trioxide aggregate may offer an advantage over calcium hydroxide for pulp capping and pulpotomy due to its superior sealing ability, biocompatibility, and reduced solubility, it is necessary to perform it in two appointments. Hence, calcium hydroxide was selected.

Studies have reported that the primary cause of failure of fragment reattachment is recurrent dental trauma or nonphysiological use of the restored tooth [Andreasen et al., 1995; Macedo et al., 2008]. Kanca [1996] reported a reattachment procedure with the fragment being intact at the 5 year follow-up visit; however their case had a pulpal exposure at the time of trauma which was sealed with a dentine adhesive. The pulpal response in such cases is usually a result of marginal leakages rather than the procedure itself. Reports and clinical experience demonstrates that reattachment of fractured coronal fragments result in successful short- and medium-term outcomes [Oz et al., 2006; Baratieri et al., 1990; Rappelli et al., 2002]. Authors have suggested that fabrication of a mouthguard and patient education about treatment restrictions may enhance clinical success as reattachment failures may occur with new trauma or parafunctional habits [Andreasen et al., 1995].

Conclusion

Reattachment of the intact fractured segment is an ultraconservative method for aesthetic rehabilitation, as it preserves maximum natural tooth structure. In this particular case, the fractured fragment was maintained as an esthetic restoration as well as functional adjuvant (proper seal for the Cvek’s pulpotomy). So, this procedure should be considered as a viable option for patients with coronal fractures of the anterior teeth, especially in younger ones.

Reference

Fracture reattachment in immature teeth


Chu FC, Yim TM, Wei SH. Clinical considerations for reattachments of tooth fragments. Quint Int 2000;31, 385-91.


Hattab FN, Yassin OM, al-Nimri KS. Talon cusp in permanent dentition associated with other dental abnormalities, review of literature and report of seven cases. ASDC J Dent Child 1996;63:364-76.


