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Management of Complicated Crown Fracture of Young Permanent teeth in Physically Handicapped Patient: a Case Report

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ABSTRACT
Tooth injuries constitute an integral part of clinical dentistry. Complicated crown fracture is the most common injury in the permanent dentition. The success of treatment and prognosis of the traumatized tooth depends on accurate diagnosis and treatment procedures and materials. The treatment becomes even more challenging when it is for a physically handicapped child. The aim of the case report is to present esthetic rehabilitation of the teeth with complicated crown fracture. 8 year old physically handicapped patient was referred to Department of Pediatric Dentistry, with complicated crown fracture with fracture line extending beyond the cervical junction palatally and subgingivally in relation to 21 but the fracture line could not be traced clinically. Uncomplicated crown fracture with 11. With advanced diagnostic technique i.e CBCT extension of palatal fracture line was diagnosed. Root canal treatment, followed by composite build up was done.

Keywords: Traumatic Injury, Physically Handicapped Child, Behaviour Management

INTRODUCTION

Special health care needs are defined by the American Academy of Pediatric Dentistry (AAPD) as “any physical, developmental, mental, sensory, behavioural, cognitive, or emotional impairment or limiting condition that requires medical management, healthcare intervention, and/or use of specialized services or programs.” (1) Disabled children, including those who are mentally, socially, or physically challenged, typically tend to have more obvious oral health problems, owing to their actual disability or related medical conditions. Studies have shown that children with disability have worse oral health and require more frequent and complex treatment than healthy children. The majority of children with special health care needs have poor oral hygiene with high caries prevalence and moderate gingivitis. The incidence of malocclusion among physically and/or intellectually disabled (ID) children is reported to be higher than in healthy children. (2)

Hearing loss is one of the most common chronic health problems, affecting people of all ages, in all segments of the population and at all socioeconomic levels. Hearing loss affects approximately 17 out of every 1000 children and young people under the age of 18. The incidence increases with age. Hearing loss may vary from a mild, but significant decrease in hearing sensitivity to a total loss. WHO estimates that in 2001, 250 million people around the world had a hearing impairment (moderate or severe). Children with hearing impairments are one of the main groups in the child population with disabilities. (3)
Crown fractures are the most common consequences of traumatic injuries that mainly occur in the anterior permanent dentition. It is estimated that a quarter of the population suffers a minimum of one dental

traumatic injury related to coronal fractures of the anterior teeth before the age of 18 years, the most common of which are attributed to falls, high impact sports, and motor vehicle accidents. (4) Facial trauma that results in fractured, displaced or lost teeth can have significant negative functional, esthetic and psychological effect on children. (5)

Dental fractures frequently involve only the enamel, or enamel and dentin, without affecting the pulp. Occasionally, however, the pulp is also involved. Due to their position, the teeth most frequently affected by dental traumatism are the maxillary incisors: 80% centrals and 16% laterals. (6) It has been reported that, dental injuries occur between the 2-4 ages in deciduous dentition period and between 8-10 ages at permanent dentition period. Tooth and oral tissue injuries following trauma may cause psychological, aesthetic and psychologic problems. Both children and families are affected negatively because of these problems. (7) If the fracture also exposes the dental pulp the injury is defined as a 'complicated crown fracture' or a Class 3 fracture (Ellis & Davey 1970, Andreasen & Andreasen 1993). The incidence of complicated crown fractures ranges from 2% to 13% of all dental injuries and the most commonly involved tooth is the maxillary central incisor (Andreasen & Andreasen 1993). The degree of pulp exposure may vary from a minute pinpoint exposure to total exposure of the coronal pulp. The exposure of the pulp makes the treatment challenging. If left exposed, the pulp will become necrotic through bacterial contamination. The outcome of treatment depends on the extent of the injury, the quality and timeliness of the initial care and the recall protocol (Andreasen & Andreasen 1994a,b). The following situations must be considered when choosing a treatment approach for a complicated crown fracture. Time period between the incidence of injury and initiation of treatment, Level and position of tooth fracture line, Root development stage, Pulpal involvement, Availability of displaced tooth fragments, Concomitant alveolar bone injury. (8)

The complicated crown-root fractures are diagnosed with clinical and radiological examinations. The evaluation of mobility, percussion sensitivity, palpation sensitivity of soft tissue, crown length are performed while clinical examination. The fracture line must be followed carefully while radiographic evaluation. More than one periapical radiographs must be taken from the different angles in order to diagnose the fracture line. In addition, occlusal radiographic may help the diagnose. But, if the x-rays do not correspond to fracture line or if the superposition of anatomic tissues or filling materials occurs, traditional radiographic may be inadequate. Recently, it has been reported that cone beam computed tomography (CBCT) is efficient for the diagnosis of root fractures. (7)

The prognosis of crown fractures appears to depend primarily upon a concomitant injury to the periodontal ligament. The age of the pulp exposure, extent of dentin exposed, and stage of root development at the time of injury secondarily affect the tooth's prognosis. (9)

The present case report describes an alternative approach of restoring a fractured maxillary permanent central incisor with a composite build-up after repositioning of the periodontium with laser on a Physically Handicapped Child patient.

Case Report

A 8 year old female patient reported to the Department of Pedodontics and Preventive Dentistry at SDKS Dental College, Nagpur with the complaint of broken tooth in upper front teeth region 1 day back as a result of hitting to a hard object while playing at park. The patient was Physically Handicapped with hearing and speech impairment since birth. Clinical examination revealed a complicated crown fracture with fracture line extending beyond the cervical junction palatally and subgingivally in relation to 21 but the fracture line could not be traced clinically. Uncomplicated crown fracture was seen with 11. The fractured segment showed grade III mobility. The tooth 21 was also tender on percussion with pulp exposure seen clinically with 21. There was no sign of pulp exposure or tenderness seen with 11. (***fig 1***)

Radiographic examination revealed a complicated crown fracture with fracture line extending into cervical third of root. (***fig 4***)Cone beam computed tomography was taken to get a clear picture of extension of fracture line from the patient for the certain diagnosis after receiving approval from the parent. As a result of the evaluation of the tomographic views, fracture of palatal aspect with 21 at cervical third of crown. (***fig 5, 6***) The patient and

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the family were informed about the treatment options and the approval received from the family.

Taking into consideration the special condition of patient, single sitting root canal treatment of 21 was done. Under local anesthesia, vital pulp tissue was extirpated; Obturation was completed by lateral compaction, using gutta-percha (Dentsply Maillefer) and AH Plus sealer (Dentsply Maillefer, Konstanz, Germany). The access cavity in tooth 21 was sealed with a cotton pellet and glass ionomer (*Fuji* II, *GC* Corporation, Tokyo, Japan) and the tooth was assessed radiographically. (***fig 6***)

Direct composite restoration was done with 11. Enamel-dentin tissues of the tooth were etched by 37% phosphoric acid for 15 seconds. Following the etching procedure, tooth was rinsed with water in order to remove the acid. A hybrid resin (Ivoclar Vivadent (Saul Paulo, Brazil)) was applied using the incremental technique. Each increment was light cured (QHL75 Curing Light; Dentsply, Addlestone, U.K.) for 40 s.(***fig 2***)

The palatal fragment was mobile, which was then extracted under infiltration. (***fig 7, 8***) 1 week post extraction, the gingival contour remained bulky and scalloping was not regained. It was then decided to contour the gingival tissue by using the diode laser fiber optic technology (SIROLaser®, Sirona, Bensheim, Germany) The patient was instructed to wear protective goggle, and local anesthesia was given using the topical spray technique. Bleeding points were marked with the help of the Crane-Kaplan pocket marker. A laser handpiece was activated, and gingival tissue was removed in a sweeping stroke joining the bleeding points. A high-volume suction device was used during the procedure. No periodontal pack was placed, and there was mild bleeding and no discomfort immediately after the procedure.(***fig. 9, 10***)

Immediately after gingivectomy procedure, core buildup with composite was planned. 3-4 mm of GP was removed using peeso reamer. (***fig. 11***). A thin layer of GIC (*Fuji* II, *GC* Corporation, Tokyo, Japan) was placed within the canal. (***fig. 12***) Canal was etched by 37% phosphoric acid for 15 seconds. Following the etching procedure, tooth was rinsed with water in order to remove the acid. A hybrid resin (Ivoclar Vivadent (Saul Paulo, Brazil)) was applied using the incremental technique. Each increment was light cured (QHL75 Curing Light; Dentsply, Addlestone, U.K.) for 40 s. (***fig. 13***) Thereafter, taking the support from within the canal, composite build up was done with 21. Finishing and polishing of the buccal and palatal surface were carried out with abrasive discs, felt discs, and polishing pastes. (***fig. 3***)

Discussion

Dental injuries usually cause severe problems that effect patients from the point of pain, function, aesthetic and psychological. The basic factors that determine the injury level following dentoalveolar trauma are; the severity of trauma, type, direction, elasticity of the object, the absorption level of lips and other soft tissues, the quantity and quality of the tooth and jaw structures.(10)

The amount of time that has elapsed since the accident is an important factor to consider before deciding on the treatment approach for the traumatically exposed pulp. It is suspected that the risk of contamination and the depth of infection through the exposed area increase by the elapsed time, and root canal therapy or coronal pulpotomy is performed. (11) Treatment alternatives must take into consideration the patient's compliance and tolerance toward invasive dental treatment in the clinical setting. A developmentally disabled patient with autism, seizure disorder, and a history of aggressive behaviour may not be able to tolerate complicated surgical, orthodontic, and restorative treatment options involving multiple visits. (2) In the present case, the patient had speech and hearing impairment which made the patient very apprehensive towards the dental treatment. Though the patient was co-operative, it was a challenge to provide the patient with quick restoration of the esthetic appearance and relief of discomfort within minimum appointments.
San Bernardino and collaborators proposed rules to improve communication with the patient who presents this functional diversity, these include knowing the form of communication that they use for their social development, whereas the different methods, how to use language of signs, written language, lip reading or mixture of any of these. It is important to know the behavior of the patient with auditory deficit, they should be made certain

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adjustments during the consultation. A study by Champion and collaborators showed that it is useful that the dentist, while talking with the patient, remove the top mouth to facilitate the use of signs, gestures and the interpretation of the lips that can improve communication with children deaf. Another most used communication method can be assistance of an interpreter in the operatory during the treatment, a close relative or a friend. (3)

In the present case, mother of the patient was present in the operatory during treatment for proper communication with the patient. Same pedodontist, was handling the child in all her appointment, with same dental operatory, appointment times to help sustain familiarity. Consistency was maintained throughout all the appointment for maintaining the co-operation of patient. Early appointments were scheduled for the patient, to ensure that everyone is alert and attentive. Arrangements were always made to keep the waiting time reduced to avoid any los of co-operation during treatment, as long waiting period makes such patient irritated and leads to loss of co-operation.

The technique described in the present case report is simple, quick, and economic compared with other more invasive procedures. Isolation is the key to success in such cases. Rubber dam was not possible in this case, but adequate isolation was achieved using cotton rolls, cheek retractor and high speed suction. It has been reported that CBCT is an important option for the diagnosis of complicated crown fracture extending subgingivally.

Subgingival crown fractures are challenging in terms of coronal rehabilitation (Callskan 1999). In such cases the treatment should be aimed at exposing the fractured margins, so that all clinical procedures can be achieved with strict moisture and haemorrhage control. Furthermore, the prognosis may be improved further through better plaque control by the patient (Olsburgh et al. 2002). (8)

Alternatives for gingival tissue removal include the use of a scalpel, electrosurgery, and/or lasers. The traditional surgical approach utilizing a scalpel blade exhibits the disadvantage of eliciting bleeding. Alternatively, electrosurgery providing adequate but, heat generation with this technique, occurs to a degree where an irreversible damage to the alveolar crest may result. Lasers offer the potential of increased operator control and minimal collateral tissue damage. Diode lasers, specifically, operate at a wavelength that is easily absorbed by the gingival tissues while posing a little risk of damaging the tooth structure. The prime rationale for the use of laser in this pediatric patient was to give a painless and bloodless substitute for the scalpel-facilitated surgical procedures. It also reduces the perception of fear and anxiety in the patient, thus instilling a positive attitude toward the dental treatment. Lasers also reduced the use of local anesthesia, suturing, periodontal dressing, and postoperative medications. It also reduces the effective chairside time. (12)

There are number of options related to anterior esthetic restoration in permanent anterior teeth like post and core, anterior esthetic crown. But composite build up was done in the present case because of the special condition of the child to co-operate on the chair during the treatment and also to reduce the treatment time and visit. Composite restoration was placed such that support was taken from within the canal. In complicated fractures that have been endodontically treated, their pulp chamber provides space that serves as an inner reinforcement, so further preparation of the fractured tooth is not required. (13) At the restorative appointment, a thorough analysis of the color, form, occlusion, and surface texture characteristics of the affected and adjacent teeth should be performed. At least one composite shade for the dentin stratum and one composite shade for the enamel stratum should be selected. (14)

Conclusion

Trauma in permanent anterior teeth causes psychological stresses at children. Crown fracture of anterior permanent teeth extending subgingivally should be examined thoroughly. Its management is complicated as the fracture line could not be seen and require various advanced diagnostic techniques. It becomes even more difficult while managing a physically handicapped child. A simple, fast, affordable, and esthetically predictable technique for management should be selected in such cases. The dentist should use a different management in the relationship with patients with functional diversity without modifying conventional methods of dental treatment. All the strategies used in the management

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of patients with sensory functional diversities are aimed at establishing effective communication.

Why this Paper is important for Pedodontics

- As a pediatric dentist, it is very important to know the behaviour management of physically handicapped patient, which is well described in this paper.
- Pediatric dentist are the first person who deal with the management of traumatic injuries of young permanent teeth. This paper deals with a different approach of dealing with such cases.
- This paper focuses on a better esthetic treatment approach for a physically handicapped child.

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Fig 1. Preoperative image of 11, 21. Fig 2. Composite build up with 11. Fig 3. Postoperative image of restoration with 21

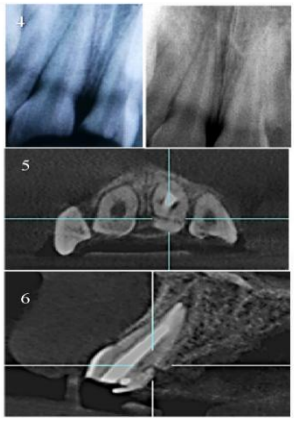

Fig 4. Preoperative RVG of 11, 21. Fig 5. CBCT showing fracture line extending mesiodistally with 21. Fig 6. CBCT showing fracture of palatal aspect with 21 at cervical third of crown

Fig 7. Mobile palatal fragment with 21. Fig 8. Extracted palatal fragment. Fig 9. Gingivectomy of 21 palatally with Laser. Fig 10. Immediately after gingivectomy. Fig 11. Removal of GP using peeso reamer. Fig 12. Intracanal application of GIC. Fig 13. Postoperative image with composite build up with 21

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