Case report

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Clinical case of Trauma to Permanent teeth in Childhood

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Abstract

Injuries to the teeth and soft tissues are prevalent in childhood and adolescence. About a third of children suffer this type of traumatic injury, mainly during household and sports activities. They could seriously affect the social and psychological development of the individual. Untimely treatment often leads to pathological changes in periodontal tissues and irreversible damage to the pulp and periodontium. The article aims to present a clinical case of fractures of the upper central incisors in a 15-year-old child two months after the trauma. As a result of the delay in treatment, gingival hyperplasia and devitalisation of the traumatised teeth are observed. After the examinations, periodontal and endodontic treatment is carried out with the restoration of fractured crowns, which leads to the resumption of the patient's function and aesthetics.

Keywords: dental traumas, crown fracture, permanent teeth in childhood

Introduction

Dental injuries are a significant public health problem due to their frequent impact on oral, general health, and quality of life. Injuries in the oral cavity are not diseases; every individual is at risk of them. A recent study showed that one billion people have experienced this type of traumatic injury (1). The type and severity of this type of injury have an impact and are also a prerequisite for costly treatment (2, 3). Trauma to the teeth and periodontal tissues is most often observed in childhood. Epidemiological studies show that the annual incidence of dental injuries worldwide is about 4.5%. It has been found that approximately one-third of children and adolescents and one-fifth of adolescents and adults have suffered traumatic damage to their teeth (4). In most cases, the central incisors of the upper jaw are affected, mainly by falls in young children at home and sports activities in adolescents (5).

Case Description

We present the case of a 15-year-old adolescent with fractured central incisors of the upper jaw and gingival hyperplasia who sought dental help two months after suffering a traumatic accident on a winter rink. During

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the fall, the patient received a laceration-contusion wound on the lower lip, which was sutured at the „Pirogov Institute for Emergency Medical Care“ - Sofia, where he was given first aid.
During the dental examination, it was found that the extraoral status was without peculiarities. The intraoral status showed neglected oral hygiene, with an abundant amount of dental plaque and hyperplasia gingiva with bleeding when touched in the area of the discoloured upper frontal teeth; oblique fractures of the central incisors of the upper jaw without visible involvement of the pulp chamber (Fig. 1).

Figure 1

Figure 2

Figure 3

X-rays were ordered, which showed an expansion of the periodontal space of the left central incisor (Fig. 2, 3).

The electropulp test data to establish the teeth' vitality in the frontal region of the upper and lower jaw are over 200 μA for the two central incisors. The thermal test with ice showed the lack of sensitivity of the fractured central incisors. The patient is prepared for surgical treatment of hyperplasia gingiva with professional oral hygiene and the appointment of mouthwash with chlorhexidine - Eludril Care without alcohol and sugar content. The hyperplasia gingiva was excised, and the result obtained after treatment was photodocumented (Fig. 4).

Figure 4

Figure 5

Figure 6

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Endodontic treatment was performed on the two central incisors of the upper jaw. The final filling of the root canals is through lateral condensation (Fig. 5 and Fig. 6).
The teeth were restored with the light-cured composite material Gradia of the company GC using celluloid crowns (Fig. 7).

Figure 7

Discussion

Traumatic tooth injuries mainly affect children and young people and are most often recorded in the first and second decade of a person's life. (6, 7). They can seriously impact the patient's social and psychological well-being. Dental fractures are classified according to the type of fractured tissue and pulp involvement, including enamel involvement, uncomplicated crown fractures (enamel fractures and enamel and dentin fractures), complicated crown fractures (enamel and dentin fractures involving the pulp), crown and root fractures, and tooth root fracture. (8) Most of the reported traumas, such as the case of complicated enamel-dentin fractures described above, involve the frontal teeth, especially the upper central incisors (9, 10). The lower central and upper lateral incisors are affected less frequently (11, 12). Several authors describe that according to the specific type of fractures of the hard dental tissues, the most common are those of the dental crown with or without the involvement of the pulp. (13, 14).
Some studies (889 permanent teeth examined) also show that the most common injuries are enamel-dentin fractures (233 teeth (26.2%) and lateral dislocations (207 teeth (23.3%), with patients ranging in age from 7 to 65 years, but mainly children (587 damaged teeth (66.0%) are affected. That pulp necrosis was observed in 239 teeth (26.9%). (15) This is also the most common post-traumatic complication of various dental traumas. In all dislocations, teeth with complete root development show a higher prevalence of pulp necrosis than teeth with incomplete root development (15).
Other studies in 154 patients between the ages of 1 and 13 years (337 teeth with trauma (255 permanent and 82 temporary) showed that the most common were luxation injuries (43.3%), uncomplicated corona fractures (20.5%) and complicated corona fractures (19.4%), with the leading causes being falls (55.2%) and impact from an object (22.1%) (16).
According to the International Association of Dental Traumatology (IADT, 2020), complicated crown fracture treatment includes conservative pulp treatment, such as partial pulpotomy, in both teeth with completed and incomplete root development. The condition of the pulp should be determined before starting treatment. (17)
In the described case, the traumatised teeth had completed root development, but due to the impossibility of preserving their vitality, a decision was made to carry out endodontic treatment.

The decision on the type and method of treatment of traumatic injury is based on individual and standardised clinical and paraclinical studies. Clinical studies include:

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1. Extraoral examination aims to establish facial asymmetry, limited lower jaw movement, and bite displacement. No such information was found during the patient's examination.
2. Intraoral examination to detect tooth luxations, changes in the oral mucosa and gingiva, pathological occlusion, tooth displacement, and type of crown fractures. The examination established the kind of fractures of the upper teeth, the accompanying gingival hyperplasia and pathological occlusion due to an orthodontic problem.

The paraclinical methods used to assess trauma and dental vitality include X-ray examination, sensitivity tests—electropulp, pulse oximetry, and thermal (cold) tests.

In many cases, especially when tests are done immediately after the accident, it is possible to get false negative results, which means no reaction despite the preserved vitality. Often, after the trauma, the response of the pulp is temporarily lost, so sensitivity tests (cold and electropulp tests) can be negative. (18) This is also why it is recommended that pulp vitality testing should also be carried out at follow-up visits to assess any possible change ahead of time. (19) The thermal ice test performed on the fractured central incisors examined in the case described showed a lack of sensitivity. Given that the patient was admitted for treatment two months after the injury, such tests were not additionally done during subsequent visits.

The literature describes the possibilities that laser Doppler flowmetry (LDF) provides for assessing blood flow in the pulp in addition to paraclinical studies (20), but this has not been done in this case.

The values of the examined upper frontal teeth in the presented case by the electropulp test method of the second month of the injury showed a value of more than 200 μA. One month later, during the re-examination, no change was found.

Parallel periapical radiography is necessary to make an accurate diagnosis. Additional radiographs are also needed if there are signs and symptoms of other potential injuries. The diagnosis can also be clarified using computed tomography (CBCT) in root fractures, corona-root fractures, or lateral dislocations. This examination makes it possible to determine the injury's location, extent, and direction (21).

Through the X-rays, the construction of the tooth roots and the absence of root fractures and fractures of the alveolar process were established. The study observed periapical changes in the upper frontal incisors and expansion of the periodontal space in the upper left central incisor. The fracture line passes close to the pulp chamber of teeth 11 and 21, which defines the fracture as enamel-dentin. No fractures of the crowns and roots were found in teeth 12 and 22.

Hard dental and periodontal tissue conditions were consistently assessed during initial and follow-up visits (22).

Unfortunately, increasing the time between the injury and receiving timely and adequate care from the dentist leads to lower treatment success. (23, 24). In the case described, the period between the moment of the accident and the visit to the dental office led to both the lack of vitality in the examined teeth and the manifestation of gingival hyperplasia due to both fractures of the central incisors, difficult oral hygiene, and the existence of a pre-existing orthodontic problem in the area of trauma.

According to the adopted Consensus on the treatment of permanent teeth injuries in childhood by the National Association of Pediatric Dentists in Bulgaria and the presence of two signs or symptoms for the diagnosis of necrotic pulp, the decision was made to conduct endodontic treatment of each of the fractured teeth.

The restoration of the fractured crowns was started after the radiographic evidence of the exact implementation of the endodontic treatment of the indicated teeth.

The means and ways to restore defects in hard dental tissues, especially in the frontal areas of the upper and lower jaw, require careful judgment. This includes assessing the losses of hard dental tissues, their location, and the existing relationships between adjacent teeth and antagonists. In this case, this decision was further complicated by the presence of an orthodontic problem in the area of trauma.

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Various factors determine the adequate decision on restoring the clinical crown: avoiding the possibility of infection of the root canal and restoring function and aesthetics (25).
According to the modern endodontic concept, there are four stages in root canal treatment: cleaning, shaping, filling and finally, crown restoration. Well-adapted coronary repair aims to prevent micro-crevices with the consequent entry of bacteria and contamination of the root canal complex. This applies to both single crowns made in a dental laboratory and conventional obturations, as long as the restoration is perfect in terms of its ability to seal the tooth's root. A literature review involving 63 studies showed that periapical recovery was improved by 10% to 18% when the quality of coronary recovery was assessed as satisfactory rather than unsatisfactory (26). The final result of crown restoration after root canal treatment may become apparent only after a certain period. Devitalised teeth whose final stage of treatment is the placement of an aesthetic crown have a higher retention rate (81% ± 12% after 10 years) than devitalised teeth with composite restoration (63% ± 15% after 10 years; (27). For this reason, conventional direct composite obturations in devitalised teeth with more significant loss of hard dental tissue are defined as temporary restorations.
Following the principles in the various clinical guidelines for the restorative treatment of (un)complicated crown fractures described by different authors (28, 29, 30), in the specific case described above, it was decided to complete the treatment by constructing the fractured teeth with light-cured composite restorations, using celluloid crowns for this purpose (31).

Conclusion

The described case of severe fracture of the upper central incisors illustrates traumatism in adolescents. Early diagnosis and treatment is necessary. Timely orthodontic treatment of the existing orthodontic malformation would contribute to reducing tooth damage due to trauma.

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