

MANAGEMENT OF COMPLICATED TRAUMA TO FRONTAL TEETH WITH ALVEOLAR PROCESS FRACTURE – A CASE REPORT

МЕНАЦИРАЊЕ НА КОМПЛИЦИРАНА ТРАУМА НА ФРОНТАЛНИ ЗАБИ СО ФРАКТУРА НА АЛВЕОЛАРЕН ПРОДОЛЖЕТОК – ПРИКАЗ НА СЛУЧАЈ

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Abstract

Traumatic injuries to the dentoalveolar complex represent a serious clinical condition that often occur as a result of direct impact, falls, or sports injuries and may lead to complex damage to both hard and soft oral tissues. One of the most challenging conditions is complicated dental trauma, in which multiple types of injuries to the teeth and supporting structures occur simultaneously, particularly luxations such as extrusion and intrusion, accompanied by a fracture of the alveolar process. The aim of this paper is to present a case of a 14-year-old patient with complicated trauma to the anterior teeth, including intrusion of tooth 12, extrusion with fractures of enamel and dentin, and mobility of teeth 11 and 21. Additionally, there is contusion and enamel fracture of tooth 22, as well as a fracture of the alveolar process. The paper emphasizes a multidisciplinary approach and long-term prognosis. **Materials and Methods:** A case of severe dental trauma in a 14-year-old female patient is presented. According to the medical history, the injury was caused by a fall from a scooter and involved a fracture of the alveolar process, injuries to teeth 12, 11, 21, and 22, as well as trauma to the soft tissues of the upper jaw. The patient was initially admitted to the University Clinic for Maxillofacial Surgery, where diagnostic and therapeutic procedures, including 3D CBCT imaging and maxillomandibular fixation (MMF), were performed, along with other standard interventions for this type of injury. The patient was subsequently referred to the Clinic for Pediatric and Preventive Dentistry for further management. The affected teeth were immobilized using composite-wire splinting, endodontically treated, and restored with nanocomposite restorations. In such cases, long-term follow-up of at least five years is essential. Since the patient is young, continued growth and development of the jaws and teeth are expected. Regular follow-up examinations are necessary to ensure that these injuries do not interfere with normal growth and to detect possible complications such as root resorption and ankylosis. **Keywords:** trauma, extrusion, intrusion, multidisciplinary approach, prognosis.

Апстракт

Трауматските повреди на дентално-алвеоларниот комплекс претставуваат сериозна клиничка состојба која често се јавува при директен удар, пад или при спортска повреда и може да води до комплексни оштетувања на тврдите и на меките орални ткива. Една од најпредизвикувачките состојби е комплицирана траума, каде што истовремено се комбинираат повеќе типови повреди на забите и на потпорниот апарат, особено дислокации како екструзија и интрузија, придружени со фрактура на алвеоларниот гребен. Целта на овој труд е да се прикаже случај на третман на 14-годишна пациентка со комплицирана траума на забите во фронтот, интрузија на заб 12, екструзија со фрактура на емајл и дентин со присутна мобилност на заб 11 и 21, контузија и фрактура на емајл на заб 22, и фрактура на алвеоларниот продолжеток, со нагласок на мултидисциплинарен пристап и долгорочна прогноза. **Материјал и метод:** Сериозна стоматолошка траума кај пациентка, која е 14-годишна. Според описот, повредата е предизвикана од пад од тротинет и вклучува фрактура на алвеоларниот гребен, повреда на забите 12, 11, 21, 22 и меките ткива на горната вилица. Приемот најпрво е направен на Универзитетска клиника за максилофацијална хирургија каде што се применети техники, како 3D СВСТ и мономаксиларна фиксација (ММФ), како и други медицински интервенции што се вообичаени мерки за ваков тип повреда. Пациентката е препратена на Клиника за детска и превентивна стоматологија за понатамошен третман. Забите се имобилизирани со композитно-жичната фиксација, ендодонски третирани и реставрирани со нанокомпозитни надogradби. Во овие случаи, важно е пациентот да се следи најмалку 5 години по повредата. Бидејќи пациентката е млада (14 години), растењето и развојот на нејзините вилици и заби ќе продолжат. Потребно е редовна контрола за да се осигура дека овие фрактури и повреди не го нарушуваат природниот раст на коските и на забите и можните компликации, како што се ресорпција и анкилоза. **Клучни зборови:** траума, екструзија, интрузија, мултидисциплинарен пристап, прогноза.

Introduction

Dental trauma represents a significant health problem affecting all age groups, but it occurs most frequently in children and adolescents. It includes a wide range of injuries to the teeth and surrounding tissues resulting from physical impact, falls, sports activities, traffic accidents, or violence. Depending on the intensity and direction of the applied force, trauma may cause damage ranging from minor enamel fractures to complete avulsion of the tooth from its socket (alveolus).

Dental injuries require immediate and appropriate intervention, as timely diagnosis and proper treatment are crucial for preserving aesthetics, function, and a favorable long-term prognosis. Inadequate or delayed treatment may lead to serious complications such as pulp necrosis, root resorption, infection, malocclusion, and premature tooth loss.

Given the complexity of dental trauma and the need for modern therapeutic approaches, the development of systematic knowledge is essential for minimizing complications and achieving effective treatment^{1,2}.

Classification of Dental Trauma

Classification is important because it guides the choice of therapy, influences prognosis, and allows for standardized treatment protocols. Dental trauma is divided into two main categories:

1. Injuries to hard dental tissues and pulp:

- Enamel fracture
- Enamel and dentin fracture without pulp exposure
- Enamel and dentin fracture with pulp exposure (complicated fracture)
- Root fracture
- Crown-root fracture

2. Injuries to the periodontium and surrounding structures:

- Contusion
- Subluxation
- Extrusion
- Lateral luxation
- Intrusion
- Avulsion

In addition to the teeth, surrounding oral tissues may also be affected:

- Alveolar bone (alveolar process fracture)
- Gingiva and soft tissues (lacerations, contusions, abrasions)
- Lips, tongue, and oral mucosa (3–6)

Extrusion (Extrusive Luxation)

Extrusion is a luxation injury in which the tooth is partially displaced out of the alveolar socket in a coronal direction. This injury results from tearing of the periodontal ligament fibers, compromising the periodontal ligament and causing partial disruption of the neurovascular bundle at the level of the root apex. It most commonly occurs following moderate to severe trauma, where vertical forces displace the tooth from its socket. Prompt repositioning and stabilization are essential to prevent pulp necrosis and root resorption⁷.

Although extrusion itself does not necessarily involve alveolar bone damage, severe trauma may cause fractures or microfractures of the alveolar process. Clinically, this injury may be characterized by mobility of the affected tooth or involved segment, swelling, and hematoma, while radiographically a disrupted cortical bone outline may be observed. Treatment requires careful repositioning of the affected tooth and flexible splinting for approximately two weeks. Close follow-up of all involved teeth is necessary due to the high risk of pulp necrosis and root resorption^{8,9}.

Intrusion (Intrusive Luxation)

Intrusion represents the most severe injury to the tooth-supporting structures, in which the tooth is displaced axially into the alveolar bone. This displacement causes compression and destruction of periodontal ligament fibers, as well as damage to the neurovascular complex, resulting in a high incidence of ankylosis and inflammatory root resorption¹⁰.

Unlike extrusion, intrusion leads to severe degenerative consequences, particularly in permanent teeth^{7,10}.

Enamel and Dentin Fracture

This injury involves damage to the enamel and underlying dentin without pulp exposure. Since dentin is an innervated and permeable tissue, patients often experience pain in response to thermal and mechanical stimuli, along with an increased risk of bacterial invasion and pulpitis⁹.

Alveolar Process Fracture

An alveolar process fracture is a serious injury affecting the alveolar bone supporting the teeth. It typically results from high-impact forces such as sports injuries or traffic accidents and is often associated with displacement of multiple teeth that move as a single bony segment⁷.

Objective:

The objective is to present a case of treatment of a 14-year-old patient with complicated trauma to the anterior teeth and fracture of the alveolar process, with an emphasis on a multidisciplinary approach and long-term prognosis.

Material and methods: Case report

A fourteen-year-old female patient presented to the Public Health Institution (PHI) University Surgical Clinical Center "St. Panteleimon", Skopje, at the Clinic for Pediatric and Preventive Dentistry due to a traumatic injury in the anterior region. From the anamnestic data obtained from the parent and the patient herself, it was reported that the injury occurred two days prior to presentation, during a fall from a scooter.

On the same day of the injury, she was admitted to the Clinic for Maxillofacial Surgery. A fracture of the maxilla with dislocation of the anterior teeth into the soft tissues, as well as fractures of the hard dental tissues, was diagnosed. A 3D CBCT scan was performed.

Under local anesthesia, repositioning of teeth 12, 11, 21, and 22 was performed, followed by fixation with MMF (maxillomandibular fixation) using a flexible splint (0.5 mm wire) (Figures 1 and 2). Antibiotic, analgesic, and corticosteroid therapy was prescribed.



Figures 1. and 2. MMF suture (monomaxillary fixation with a resilient splint 0.5)

The patient was then referred to the Clinic for Pediatric and Preventive Dentistry for continuation of treatment with the placement of composite-wire splinting.

A multidisciplinary team was formed for treatment. During the clinical examination, blood and Betadine



Figures 3. Orthopantomographic radiograph

residues were observed, as well as orthodontic brackets on the lateral teeth from ongoing orthodontic treatment.

A complicated trauma was diagnosed, including intrusion of tooth 12, extrusion with fracture of enamel and dentin with mobility of teeth 11 and 21, and contusion with enamel fracture of tooth 22. The patient was referred for radiographic imaging (Figure 3.).

First, soft deposits and coagulum were carefully removed with a brush and a low-speed handpiece to obtain a clearer picture of the type of injury and the status of the teeth (Figure 4.).



Figures 4. Preparation of teeth for placement of composite-wire fixation.

Due to the specificity of the injuries, the presence of edema, and the limited mouth opening, rubber dam isolation was not feasible; therefore, a decision was made to provide a dry working field using relative isolation with cotton rolls and suction.

The teeth were prepared by etching with 37% orthophosphoric acid for 20 seconds, followed by thorough rinsing with a water spray. Adhesive bonding was applied to the affected teeth, and teeth 15, 14, 13, 23, and 24 were additionally included in the splinting.

A flexible splint of appropriate length was selected. The splint was first fixed to teeth 15, 14, 13, 23, and 24 using



Figures 5. - 8. Placement of composite-wire fixation.



Figures 9. Follow-up examination at 14 days.



Figures 10. Follow-up examination at 28 days.



Figures 11. and 12. Condition after removal of the composite-wire fixation and endodontic treatment of teeth 22, 21, and 11.



Figures 13. and 14. Nanocomposite restorations.

flowable composite. Subsequently, fixation of teeth 11, 21 (which had been manually repositioned), and 22 was performed. Tooth 12 was not included in the splinting because it was intruded and in infra occlusion.

The splint was reinforced with conventional composite resin. At that stage, the primary goal was retention of the teeth rather than aesthetic outcome (Figures 5.–8.).

The patient was given instructions for maintaining oral hygiene at home and an appropriate diet. A follow-up examination was scheduled after 14 and 28 days (Figures 9 and 10). At the control examination, soft deposits were carefully removed. The situation was stable; however, it was still too early to predict the final treatment outcome.

After 4 weeks, the MMF fixation and composite–wire splint were removed. Due to limited mouth opening and the inability to perform adequate endodontic treatment of teeth 22, 21, and 11 while the splint was in place, endodontic therapy was performed after removal of the fixation.

The root canals were obturated with mineral trioxide aggregate (MTA). Pulp vitality testing had previously been performed and was negative (Figure 11. and 12.).

The following day, the teeth were restored with aesthetic nanocomposite resin materials (Figures 13. and 14.).

Follow-up examinations were performed at 3, 6, and 12 months. The condition after 1 year was highly favorable,



Figures 15. and 16. Clinical results after 1 year.

despite the complicated trauma. The teeth demonstrated satisfactory mobility control, function, and stability. Radiographic evaluation showed no signs of root resorption. The soft tissues exhibited satisfactory contour, color, and texture (Figures 15. and 16.).

Conclusion

Complicated multiple dentoalveolar trauma requires a complex and individualized therapeutic approach, which may include repositioning, stabilization, endodontic treatment, restoration, and, in some cases, surgical intervention. Injuries accompanied by bone fractures require urgent and long-term management, with clinical and radiographic follow-up for at least five years.

Treatment success depends on the timing of intervention, the patient's age, root development, and the extent of periodontal tissue damage. Furthermore, patient cooperation, maintenance of good oral hygiene, and timely management of secondary complications play a crucial role in successful healing.

When treatment is performed in accordance with contemporary clinical protocols and guidelines, complex dentoalveolar fractures can be managed with satisfactory functional, esthetic, and biological outcomes, allowing long-term preservation of both teeth and alveolar

bone. Due to its complexity and potential for serious complications, complicated dentoalveolar trauma remains an important area of clinical practice and research in modern dentistry.

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