



## Pediatric mandibular fracture therapy – A case report

### Lečenje preloma donje vilice kod dece

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#### Abstract

**Introduction.** Frequency of pediatric mandibular fractures is relatively uncommon. Apart from rare exceptions, there is minimal invasive access in the treatment of those injuries in order to avoid the future developmental disorders. **Case report.** During the game with a colt, a 6-year-old boy was kicked by hoof in the chin. The child did not lose consciousness and did not experience nausea or vomiting. According to clinical examination and radiological analysis, diagnosis was assigned as dislocated mandibular fracture in the parasymphysis part of the jaw and luxation injury of teeth 31 and 72. The surgical treatment under general anesthesia encompassed reduction and bimanual manipulation of bone fragments up to the optimal restoration of the dental occlusion, along with osteosynthesis with titanium miniplates. Luxated deciduous tooth 72 at the fracture line was extracted and luxated permanent tooth 31 was fixed to tooth 41 with wire. The patient was given antibiotic therapy. Additional immobilization of the luxated tooth 31 and mandibular fracture was performed after surgery by composite resin splint. During five-month follow-up period there were no signs of pathological movements in the fracture line, no luxation of tooth 31 and no restriction in mouth opening. **Conclusion.** Osteosynthesis with miniplates is adequate and very efficient treatment method in dislocated mandibular fracture that is recommended in children with both deciduous and mixed dentition. It is necessary to remove miniplates after fracture consolidation.

#### Key words:

child, preschool; fracture fixation, internal; mandible; mandibular fractures; oral surgical procedures; treatment outcome.

#### Apstrakt

**Uvod.** Rasprostranjenost preloma donje vilice je relativno mala kod dece. Da bi se izbegli naknadni poremećaji u razvoju vilice, sem retkih izuzetaka, u lečenju se primenjuje minimalno invazivni pristup. **Prikaz bolesnika.** U toku igre sa ždrebetom, šestogodišnji dečak je dobio udarac kopitom u bradu. Nije gubio svest, niti je imao gađenje i povraćanje. Na osnovu kliničkog pregleda i rendgen analize postavljena je dijagnoza dislokovanog preloma donje vilice u parasimfnoj regiji i luksacija zuba 31 i 72. U opštoj anesteziji je izvršena hirurška repozicija, uz bimanuelnu manipulaciju koštanih fragmenata do uspostavljanja optimalne dentalne okluzije, a zatim je izvršena osteosinteza donje vilice sa titanijumskim mini pločicama. Luksirani mlečni donji levi lateralni sekutić (72), koji se nalazio u liniji preloma, je ekstrahovan, a luksirani donji levi centralni sekutić (31) fiksiran čeličnom žicom za donji desni centralni sekutić (41). Ordinirana je antibiotska terapija. Dodatna imobilizacija luksiranog zuba (31) i frakture donje vilice izvršena je postoperativno, pomoću kompozitnog splinta. Posle petomesečnog opservacionog perioda nije bilo znakova patološkog pomeranja u predelu frakturne linije, luksacije zuba 31, kao ni ograničenog otvaranja usta. **Zaključak.** Osteosinteza mini pločicama pokazala se kao adekvatna i vrlo efikasna metoda lečenja i preporučuje se u slučajevima dislokovanog preloma donje vilice kod dece sa mlečnom i mešovitom denticijom. Neophodno je ukloniti mini pločice posle konsolidacije preloma.

#### Ključne reči:

deca, predškolska; prelomi, fiksacija, unutrašnja; mandibula; mandibula, prelomi; hirugija, maksilofacijalna, procedure; lečenje, ishod.

## Introduction

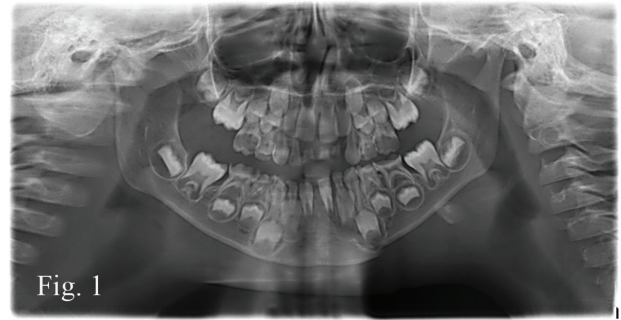
The mandible fractures frequency is low in children, and occurs in 5% of all maxillofacial traumas<sup>1</sup>. The most of pediatric mandible fractures are not dislocated because of the bone elasticity and existing tooth buds that holds firmly the fragments together “like glue”<sup>1</sup>. Frequency of the mandible injury is more commonly present in boys than girls by a ratio of 2 : 1<sup>2</sup>. Treatment of pediatric mandible fractures is different in relation to that in adults, concerning the age of a child, the level of tooth development along with the teeth that start to grow-ups, or others still unerupted<sup>3</sup>. Fracture treatment is basically more difficult concerning deciduous teeth as their roots size is not enough strong to support fixation of mandible fragments with maxillary-mandibular fixation (MMF)<sup>4</sup>. Younger patients also have better potential for restitution and remodeling comparing to the sclerotic type of remodeling seen in adults<sup>2</sup>. The principal conditions for successful bone healing are: early specific treatment, morphological reduction of bone fragments, immobilization and prevention of the infection. In the case of displaced bone fragments the use of closed reduction and immobilization are carried out a priori to avoid future functional disorders<sup>2,3</sup>. Most fractures in children without dislocation of the fragments have been treated conservatively by dental splints, occlusal splint with circum-mandible wires, or absorbable plates and screws, all of them being well eligible and quite effective<sup>1</sup>.

In this paper we described a case of rare pediatric parasymphysis mandible fracture with large dislocation of fragments that was successfully treated by a rigid internal fixation with titanium miniplate system.

## Case report

During the game with a colt, a 6-year-old male child was hit by hoof in the chin. After the injury, the patient came to the General Hospital where he got the first aid, and his soft-tissue wounds were thoroughly debrided. There was no history of bleeding from nose, ears or the head injury. The father reported no syncope, vomiting or drowsiness in the child. The patient was sent to the Dentistry Clinic of Vojvodina, Novi Sad, Serbia, where the further injury management was organized after pediatric dentist examination by joint work of surgeon, pediatric dentist and orthodontist. Extraoral examination revealed an one inch lacerated wound on the chin with gaping borders but homeostasis had already been achieved. The child had swelling and bruising in the submental region and mouth floor. There were also facial asymmetry, restricted mouth opening, deviation of the mandible to the affected side, incorrect speech and pain in the left part of the chin during the examination. An intraoral examination, revealed laceration presented in lower labial vestibule, luxation injury of the central mandible incisors (31, 41) and lateral deciduous incisor (72). Fractured segments mobility, step defect and tenderness were observed in the left parasymphysis region. Radiological examination showed left parasymphysis fracture between left mandible, central displaced permanent incisor (31) and lateral deciduous incisor (72), with fracture line runs downward and backward (Figure 1). There was a large (7 mm) dislocation of fragments which it is not very com-

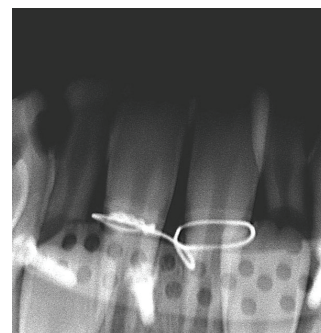
mon type of mandibular fracture at this young age. Usually, this injury is associated with unilateral or bilateral condylar fracture but not in this case.



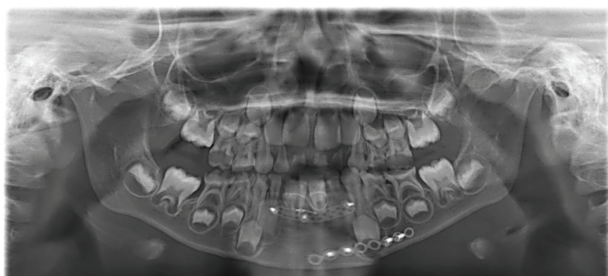
**Fig. 1 – Preoperative orthopantomograph view of left parasymphyseal fracture.**

## Management

Informed written consent was obtained prior to the treatment beginning. Surgery was performed under general anesthesia. We used a rigid internal fixation to reduce the mandible parasymphysis fracture with two 2.0 mm thickness 8-hole with gap titanium mini plates with 4 screws (1.7 mm x 5.0 mm) and 3 screws (1.2 mm x 3.0 mm). The chosen treatment in this case was an open reduction of fracture through oral lower sublabial incision. During intraoperative treatment, manual reduction of mandible fragments was performed to obtain proper dental occlusion until miniplate was placed in, to fix the fracture. As luxated lower left deciduous lateral incisor (72) was situated at the fracture line, it was extracted, and the teeth 31, 41 were fixed with wire (Figure 2). Patient's soft tissue wounds were debrided and sutured. Postoperative orthopantomograph showed reduction and left parasymphysis fracture fixed with titanium miniplate with restoration of occlusion (Figure 3). Composite resin splint (Hager&Werken) was placed after surgery (Figure 4), from the left deciduous molar to the right one (75-85) for stabilizing luxated teeth (31, 41). Postoperative antibiotic treatment was prescribed for two weeks period with antitetanus protection checked. There was recommendation for soft diet, antibacterial mouth rinse use, physical inactivity and postoperative control on a weekly basis. There were no complications observed during the healing period in 5-month follow-up with quite effective restoring of complete chewing function (Figure 5).



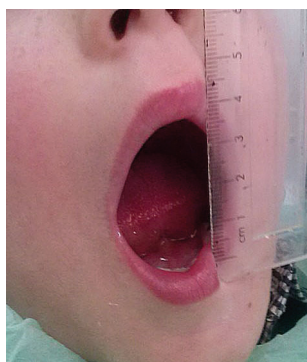
**Fig. 2 – Postoperative retroalveolar radiograph view of fixed teeth (31, 41) with wire.**



**Fig. 3 – The reduction and rigid internal fixation of left parasymphysis fracture with a titanium mini plate.**



**Fig. 4 – Composite resin splint (Hager&Werken) from the left deciduous molar to the right one (75-85).**



**Fig. 5 – Postoperative photograph showing increased mouth opening at the fifth month of follow-up.**

### Discussion

Very young age, a rare type of injury, the animal as a rare etiological factor for mandible trauma, different and contradictory opinions concerning therapy management, no consent concerning the matter of the appropriate time for plates removal in our case, uncertainty therapy outcome especially in small children with deciduous dentition, the lack of cooperation among surgeon, pediatric dentist and orthodontist, as well as no unique methods presented for treatment in such young age, gave us the reason to show this case report. It also can be very helpful, especially to pediatric dentists because they are in the position to give the first aid to the young patient before oral surgeons, and also dentists are the ones who will further follow-up injured children.

Analysis of the literature indicates the lower prevalence of pediatric mandible fractures comparing to adult population. The highest frequency of mandible fractures occurred in

younger patients, 6-12 years old (0.6%-1.2%)<sup>5</sup>. Kicks from animals as the etiological factor for mandible fracture was relatively rare, with 3.3% up to 6.0% of all maxillofacial fractures<sup>2</sup>. Various management protocols of mandible fracture treatment are discussed in the literature<sup>1</sup>. Nevertheless, some techniques may be better than others, but no one technique can be used in all situations. The treatment of fractured pediatric mandible differs from that of adults, because of anatomic variation, rapidity of healing, degree of cooperation and the potential for interference with the mandible growth<sup>6</sup>. Children have great ability for healing with few possible complications, aided by well blood supplied tissues with greater osteogenic potential than adults. Anatomic reduction in children should be accomplished earlier and immobilization time should be shorter ie. 2-3 weeks as compared to 4-6 weeks in adults<sup>7, 8</sup>. Although there is no clear consensus about optimal method for fixation of mandible parasymphysis fractures, the most effective and the less invasive method is the best one. Using conservative therapy in the majority of cases of “greenstick” or minimally displaced fractures in children with a short period of MMF is satisfying. Additionally, there are many treatments of those fractures, and some of them are: acrylic splints, circumferential wiring, the skeletal fixation through the skin, compressive and noncompressive plates, isolated screws, absorbable plates and screws, open reduction, modified orthodontic brackets, etc.<sup>9</sup>. The applied treatment of displaced fractures mostly varied from MMF to cap splints and either regular or absorbable miniplates insert. A lot of serious mandible fractures demands the wide range of therapeutic approaches from open to close reduction and rigid or non rigid fixation along with or without MMF. In our case, the reason for the pediatric mandible trauma was an accident at home. For treatment of these injuries, Davison et al.<sup>10</sup> said that the risks of facial growth disturbance in open reduction and internal fixation (ORIF) has not been supported. In contrast to that opinion, inappropriate treatment in unrecognized mandible fractures leads to high incidence of orthognathic surgery. Technique utilized to repair the fractured mandible parasymphysis, in our case, was the conventional approach of ORIF with titanium miniplates and screws. Intraoral approach through an oral mucosal incision, allow direct control of appropriate occlusion during the incorporation of the titanium miniplates which stabilize the fracture site. The use of miniplates changed the treatment of mandible fractures in the past twenty years, with varying degrees of success<sup>11</sup>. Koshy et al.<sup>12</sup> reported that ORIF is not commonly performed until late mixed dentition, but may be indicated in the early mixed dentition in severely dislocated fractures. In our case the treatment is complicated by the presence of teeth (31, 41) instability and a lot of the teeth that did not grow yet. The potential damage to tooth roots and follicles can be minimized with careful technique, which places monocortical screws in the lower mandible edge. In the majority of cases of minimally displaced fragments of the pediatric mandible fracture, using conservative methods with MMF during a short period is generally satisfying. If surgical treatment is indicated, occlusal acrylic splints, interdental wiring, and monocortical plates and screws are all eventual

option<sup>2</sup>. The use of titanium mini plates systems in relation to absorbable plates permits a stable rigid or semirigid fixation that may eliminate the necessity for MMF<sup>2</sup>. The monocortical bone plates are smaller in size and easily adaptable for application to any type of fractured site. Zimmerman et al.<sup>6</sup> consider that ORIF insures stable three dimensional reconstructions, encourages the primary bone healing, reduces the treatment time and eliminates the need for MMF. On the other hand, closed treatment of the parasymphysis fractures usually demands extended periods of MMF from 3 to 5 weeks. This can become an extremely important factor when it comes to the treatment of pediatric patients, since the level of cooperation is greatly reduced. A patient has to stay on the liquid diet, hospitalized for a longer period of time, with difficulties in regular oral hygiene, and speech is also affected<sup>2</sup>. Application of fabricated acrylic splints is more reliable than ORIF or MMF techniques with regard to the cost/ effectiveness ratio, ease of use and removal, reduced operation time, maximum stability during healing period, minimal trauma for surrounded anatomic structures etc.<sup>1</sup>, but it was not suitable in our case. Based on the literature data we can clearly recommend “minimally invasive” internal fixation by means of the monocortical plate and screws, as reported Cole et al.<sup>7</sup>. We believe that choice of ORIF should always be recommended to treat children younger than 6 years of age. With this system of fixing, we obtained the same success reported by the other authors<sup>8</sup>. This method provides better

stability of fractured fragments, primary bone healing, the low infection rate and possibility to avoid MMF<sup>11</sup>. However, this system has an important disadvantage, because plate and screws removal is recommended in order to minimize the risk of interference with normal growth of the mandible. There is a great possibility, as Bos et al.<sup>13</sup> reported, that metal implants may cause stress shielding with local osteoporosis after later removal. Certainly, ORIF could have a negative effect on skeletal growth and unerupted teeth because there is a need of plate removal after complete healing<sup>2, 3, 8, 12</sup>. Hogg and Horswell<sup>14</sup> has not seen any growth disturbances caused by miniplate osteosynthesis when they remove it after a period of 6 months. The use of absorbable plates is less likely to disturb facial skeletal growth but is still associated with risk of damaging the teeth that have not yet erupted even when using monocortical plates and screws<sup>2</sup>.

### Conclusion

ORIF treatment is suggested in large dislocated pediatric mandible fractures and must be carefully done, because of rapid growing up and developmental phenomenon that continues in children. Plates system should be removed as soon as healing period is over. Minimized invasive therapy should always be the choice, especially in children younger than 6 years of age. Joint work of surgeons, pediatric dentists and orthodontists is needed during the whole recovery period.

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