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PEDIATRIC MANDIBULAR FRACTURE THERAPY - A CASE REPORT

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Apstrakt

Ključne reči: prelom donje vilice, deca, mini pločice

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 the colt the 6-year old boy was kicked with its hoof in the chin. The child didn't faint there were no presence of nausea or vomiting. According to clinical examination and radiological analysis, diagnosis was 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 mini plates. 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 the antibiotic therapy. Additional immobilization of the luxated tooth 31 and mandibular fracture were performed after surgery by composite resin splint. During five months follow up therapy 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 mini plates 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 mini plates after fracture consolidation.

Kew words: mandibular fracture, children, mini plates
Introduction

The mandible fractures frequency is low in the children, and occurs in 5% of all maxillofacial traumas 1. The most of the pediatric mandible fractures are not dislocated because of the bone elasticity and existing tooth buds that holds firmly the fragments together “like glue” 1. Frequency of the mandible injury is more commonly present in boys than girls by a ratio of 2:1 2. Pediatric therapy fracture is different in contrast to the adults, concerning the age of the child, the level of tooth development along with the teeth that starts to grow ups, or others still unerupted 3. Fracture treatment is basically more difficult concerning the deciduous teeth as their roots size is not enough strong to support fixation of the mandible fragments with maxillo-mandible fixation (MMF) 4. Younger patients also have better potential for restitution and remodeling, comparing to the sclerotic type of remodeling seen in adults 2. 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 the future functional disorders 2,5. 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 well eligible and quite effective 1. This paper shows a case of a rare pediatric parasymphysis mandible fracture with large dislocation of fragments while a rigid internal fixation with titanium mini plate system was done as a suitable therapy choice. Very young age, the rare type of injury, the animal as the rare etiological factor for trauma, different and contradictory opinions concerning therapy management, no consent concerning the matter of the appropriate time for plates removal in our therapy case, incertitude 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. The authors of this paper also believe that it can be very helpful, especially to the pediatric dentists when they are in the position to give the first aid to the young patient before surgeons and are the only dentists who will further follow up injured children.

Case report

During the game with the colt a 6-year old male child was hit by hoof in the chin. After the injury, patient came to 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 injury to head. The father reported no syncope, vomiting or drowsiness by the child. The patient was sent to the Dental Clinic of Vojvodina, where the further injury management was organized after pediatric dentist examination by joint work of surgeon, pediatric dentist and orthodontist. Extra oral examination revealed a 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 during the examination in the left part of the chin. An intraoral examination, reviled 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 show 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 is a large (7 mm) dislocation of fragments which it is not very common type of mandibular fracture at this young age. Usually this injury is associated with unilateral or bilateral condylar fracture but not in our case.

**Management**

Informed written consent was obtained prior to the beginning of treatment. 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 our case was an open reduction of fracture through oral lower sub labial incision. During intraoperative treatment, manual reduction of mandible fragments was performed to obtain proper dental occlusion until mini plate was put 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 ortopantomograph shows reduction and left parasymphysis fracture fixed with titanium mini plate with restoration of occlusion (Figure 3). Composite resin splint (Hager&Werken) was placed after surgery (Figure 4) as from the left deciduous molar to the right one (75 - 85) for stabilizing luxated teeth (31, 41) and postoperative antibiotic treatment was prescribed for two weeks period with anti-tetanus protection checked. There is 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 five month follow-up with quite effective restoring of complete chewing function (Figure 5).

**Discussion**

Analysis of literature indicates the lower prevalence of pediatric mandible fractures comparing to adult population. The highest frequency of mandible fractures occurred in younger patients from 6 - 12 years old, reaching from 0.6 - 1.2% 6. Kicks from animals as the etiological factor for mandible fracture was relatively rare, with 3.3% up to 6.0% of all maxillofacial fractures 2. Various management protocols of mandible fracture are discussed in the literature 1. Nevertheless, some techniques may be better than others, 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 7. 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 i.e. 2-3 weeks as compared to 4-6 weeks in adults 8,9. 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 on the majority of cases of “greenstick” or minimally displaced fractures in children with a short period of MMF is satisfied. 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 non-compressive plates, isolated screws, absorbable plates and screws, open reduction,
modified orthodontic brackets, etc. The applied treatment of displaced fractures mostly varied from MMF to cap splints and either regular or absorbable mini plates insert. A lot of serious mandible fracture demands the wide range of therapeutic approach 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 these injuries, Davison et al. said that the risks of facial growth disturbance in open reduction and internal fixation (ORIF) has not been supported. In contrast to that opinion, no appropriate treatment in unrecognized mandible fractures leads to high incidence of orthognathic surgery. Technique utilized to repair the fractured mandible parasymphysis, in our case, was that of the conventional approach of ORIF with titanium mini plates and screws. Intraoral approach through an oral mucosal incision, allow direct control of appropriate occlusion during the incorporation of the titanium mini plates that stabilized the fracture site. The use of mini plates has been changing the treatment of mandible fractures in the past twenty years, with varying degrees of success. Koshy et al. 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 mono cortical 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 through a brief period is generally satisfying. If surgical treatment is indicated, occlusal acrylic splints, inter dental wiring, and mono cortical plates and screws are all eventual option. The use of titanium mini plates systems regard to absorbable plates permits a stable rigid or semi-rigid fixation that may eliminate the necessity for MMF. The mono cortical bone plates are smaller in size and easily adaptable to be applied to any type of fractured site. Zimmerman et al. said that ORIF insures stable the 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 demand 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. Patient stay on the liquid diet, hospitalized for a longer period of time, speech is affected, with difficulties in regular oral hygiene. Application of fabricated acrylic splints are more reliable than ORIF or MMF techniques with regard to cost effectiveness, ease of use and removal, reduced operation time, maximum stability during healing period, minimal trauma for surrounded anatomic structures etc. but not suitable in our case. Based on determinant therapy management in the literature we can clearly recommend “minimally invasive” internal fixation by means of the mono cortical plate and screws, as reported Cole et al. We believe that choice of ORIF should always be recommended to treat children younger than 6 years of age, whereas we obtained with this system of fixing, the same success, reported by the other authors. This method provides better stability of fractured fragments, primary bone healing, the low infection rate and possibility to avoid MMF. 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 Boss et al., 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 un erupted teeth because there is a need of plate
removal after complete healing 3,2,9,13. Nicolas et al. has not seen any growth disturbance caused by mini plate osteosynthesis as they were removed after a period of 6 months 3. The use of absorbable plates is less likely to disturb facial skeletal growth but is still associated with risk of damaging the teeth that did not erupt even when using monocortical plates and screws 2.

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 are the necessity concerning all of the follow up recovery period.

Literatura


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Legends for illustrations

Fig.1
Preoperative Ortopantomograph (OPG) view of left parasympyseal fracture

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

Fig.3
The reduction and rigid internal fixation of left parasympyseal 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, 7. month follow-up.