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Emergency Treatment of Soft Tissue and Dentoalveolar Fractures using Risdon Wiring in Children due to Motorcycle Accident : Case Report

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Abstract

Introduction: Dentoalveolar fractures are often found in children due to physical trauma, falls, and motorized accidents. In pediatric patients, there are variations in age, jaw development, and dentition which are the primary considerations in choosing a dentoalveolar fracture treatment method. This case report aims to describe and discuss the emergency management of soft tissue injuries and mandibular dentoalveolar fractures with Risdon wiring in pediatric patients due to motorized accidents.

Case report: A 9-year-old female patient complained of bleeding from the mouth due to a traffic accident. Clinical and radiographic examination showed dentoalveolar segment fractures in tooth region 32-42, stab wounds, and lacerations on the inferior lip, vestibule, and gingiva in tooth region 32-42. The patient underwent wound cleaning, wound suturing, and treatment of dentoalveolar fractures with fixation using Risdon wiring in the mandibular region 36-46.

Conclusion: Conservative treatment of dentoalveolar fractures in pediatric patients with minimal intervention can give good results. Risdon wiring as a fixation method can be used in the emergency treatment of dentoalveolar fractures in pediatric patients with mixed dentition.

Keywords: Soft tissue trauma, dentoalveolar fracture, Risdon wiring, emergency

Introduction

Dentoalveolar trauma can cause alveolar bone injuries (mandible and maxilla), dental injuries (fractures, avulsions, and luxations), and all soft tissue injuries (lips, gingiva, and tongue), ranging from bruises to very severe lacerations. A dentoalveolar fracture is a break or break in the continuity of hard tissue in the tooth structure and alveolar bone.[1] This fracture can cause soft tissue injury and tooth displacement.[2]

Studies show that maxillofacial fractures in children under 16 accounts for 1–14% of all fractures. 60% of dentoalveolar trauma occurs in children, especially those under the age of 5 years.[2] The incidence of trauma in boys is two times more frequent than in girls, associated with higher physical activity in boys. The leading causes of trauma or dentoalveolar fractures are falls, traffic accidents, and child abuse. The most common dentoalveolar trauma in patients with primary teeth is periodontal trauma and luxation, whereas hard tissue trauma and crown fracture are more specifically associated with permanent teeth. Several factors are taken into consideration when carrying out the management or treatment of dentoalveolar trauma in pediatric patients. Pediatric patients are not like adults, including: [2,3]

1. Children are in a period of growth and development, and if not handled properly,

complications such as growth disorders and ankylosis of the temporomandibular joint may occur in the future;

2. Age and cooperative level of children, assessing traumatized children can be a challenge because many children cannot speak or describe the source of their pain;

3. The trauma occurred in the permanent or milk teeth.

The goal of treating fractures in children is the same as in adults but with different management, where the development of the jaws and growth of the teeth are the primary considerations in choosing a treatment method so that fracture management in primary and mixed dentition has some difficulties.[4]

Differences in the shape or pattern of fractures in pediatric patients compared to adult patients are the continued growth and development of the facial bones, the development of the paranasal sinuses, and the elastic structure of the bones in children. The elasticity of the mandibular bones and unerupted teeth can act as an adhesive joint restraint against fracture. Osteogenic potential in pediatric patients is better, and healing is faster than in adults. Therefore, the reduction must be carried out quickly, and immobilization time should be shortened by about two weeks.[3]

The treatment choice in pediatric patients should be minimally invasive and result in restoration of the occlusion with minimal aesthetics and functional disturbances.[5] Treatment of dentoalveolar fractures is carried out by reducing or returning the fracture segments to their true position and fixation until the bone healing process occurs.[3] Patients with a mixed dentition period, fixation with arch bars is challenging to apply because of the resorption of primary tooth roots and incomplete formation of permanent tooth roots.[5] Fixation with Risdon wiring can be an alternative treatment in pediatric patients with primary and mixed dentition periods.[6] This case report aims to describe and discuss the management of soft tissue trauma and dentoalveolar fractures with Risdon wiring in pediatric patients.

Case Reports

A 9-year-old girl came to the emergency room at Hasan Sadikin Hospital Bandung complaining of bleeding from the mouth. Approximately 3 hours earlier, the patient had an accident with a bicycle when a motorbike hit him from the opposite direction, so he fell with the mechanism, his face hitting the asphalt first. The patient is not wearing a helmet and is not fainting; there is bleeding from the mouth, and there is no bleeding from the nose and ears. The patient was taken to a private hospital. The wound was cleaned, an infusion was performed, a blood lab examination and a chest photo were taken, and she was given drugs (ketorolac, tranexamic acid). Then the patient was referred to the emergency room at Hasan Sadikin Hospital for further treatment.

Figure 1: extraoral, the facial asymmetry with edema and hematoma of the inferior lip region, lacerations, and stab wounds.

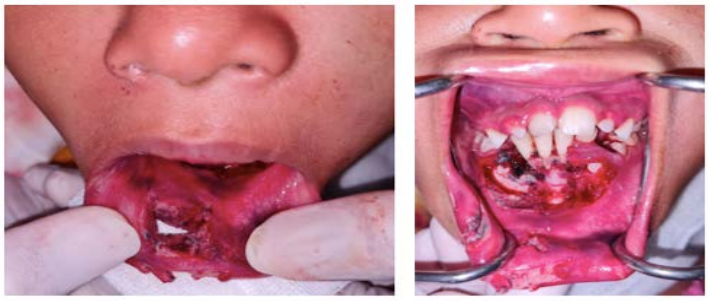

Figure 2: intra-oral, laceration, and stab wounds on the inferior lip, vestibule, and gingiva.

On clinical examination, the patient's general condition was compos mentis, breathing 28x/minute and pulse 110x/minute. Extraorally, facial asymmetry was seen accompanied by edema and hematoma in the inferior lip region. There was a stab wound measuring 3x2 cm on an irregular edge and a laceration wound measuring 3x1x0.5 cm, 1x1x0.5 cm on an irregular edge with a muscle base in the inferior lip region (figure 1). Intra-orally, there is a stab wound measuring 3x2 cm with irregular edges in the inferior lip region, laceration wounds in the vestibule and gingiva of the tooth region 33-43 measuring 4x3x1 cm with irregular edges with a bone base, and tooth mobility 32- (figure 2). The radiographic examination using the skull AP lateral x-ray technique and panoramic X-ray showed a discontinuity of the dentoalveolar bone in regions 32-42 (figure 3). The results of blood laboratory tests were still within normal limits.

Figure 3: Panoramic X-Ray and Skull AP Lateral X-Ray, showing the discontinuity of the alveolar bone in the anterior mandible.

This case was diagnosed with a fracture of the dentoalveolar segment in tooth region 32-42, a stab wound in the inferior lip region, and a laceration wound in the inferior lip, vestibule, and gingiva in tooth region 33-43. The patient's parents signed an informed consent agreement for treatment and approval to publish scientific activities. The patient was instructed to maintain oral hygiene and a soft diet and prescribed amoxicillin 3x500 mg and paracetamol tablets 3x500 mg. Chlorhexidine gargle every time after eating, hyaluronic acid gel in the intra-oral wound area, and chloramphenicol gel zalf extra-oral wound. The treatment for this case was wound debridement, suturing the laceration in the intraoral area, and wiring Risdon in the lower jaw region 36-46 (Fig.4). Removal of sutures on the sixth day. Control of the patient on the 14th postoperative day showed that the wound closed well without infection, and the Risdon wiring was well in place.

Figure 4: post wound debridement, suturing, and installation of the Risdon wiring on the mandible

Discussion

In this case report, the patient had stab wounds and lacerations in the lower lip area. Wounds are loss or damage to the integrity of body tissues; there are several types of wounds, including open wounds, closed wounds, and abrasions. An open wound is a soft tissue injury accompanied by damage or loss of continuity of the skin and may accompany the underlying tissue. Open wounds can be divided into several types, including wound cuts, wound penetrated (penetrating wounds), stab wounds, lacerated wounds (torn wounds), excoriating wounds, scratches or ragged wounds), wounds shot, and animal bite wounds. Closed wounds are tissue injuries that cause subcutaneous or submucosal bleeding without loss of skin continuity, for example, contusions and hematomas. Stab wounds are characterized by narrow but deep wounds caused by sharp, pointed objects penetrating the skin.[7,8,9] These wounds have a risk of infection because they are challenging to clean or debride and provide a suitable medium for bacteria to grow and infection occurs.[10.11]

Lacerations are the most common soft tissue injuries. They can be caused by sharp objects, such as knives, broken glass, or non-sharp objects that tear the epithelial and subepithelial tissues. If a non-sharp object causes it, the edges of the wound are usually not irregular. The depth of the laceration varies; it can only involve the external surface or extend into the tissue, disrupting nerves, blood vessels, muscles, and other anatomical structures.[7,8,10] In cases of trauma, dentists usually find lacerations of the lips, the floor of the mouth, the tongue, labial mucosa, the buccolabial vestibule, and gingiva.[11] Healing of lacerated wounds in patients has carried out wound debridement and suturing.

The surgical management of lacerations involves four main steps: (1) cleaning, (2) debridement, (3) hemostasis, and (4) closure.[7] These steps apply to lacerations anywhere in the body, including the oral cavity and perioral area. (1) Cleaning a wound is a mechanical cleaning of the wound required to prevent residual dirt from remaining. Cleaning can be done with surgical soap and may require a brush. Anesthesia is usually required. Excessive saline irrigation is then used to remove all water-soluble materials and particles. Slow irrigation is more effective at removing debris than constant irrigation. (2) Debridement of wound refers to the removal of bruised tissue, devitalization of the wound, and the removal of jagged bits of surface tissue to allow linear closure. For most lacerations dentists encounter, no debridement is required except for minor salivary gland tissue. (3) Hemostasis of the wound before closure must be achieved. Continued bleeding can compromise the repair by creating a hematoma in the tissue that can open the tissue after it has been sutured closed. If any vessels are bleeding, they should be clamped and tied with a ligature or cauterized with an electrocoagulation unit. (4) Closure of wound after the wound has been cleaned and debrided and hemostasis is achieved, the laceration is ready to be closed with sutures.[7,8,11,12]

Supporting examinations need to be carried out to support the results of clinical examinations that have been carried out previously. Investigations that can be carried out, in this case, are panoramic

x-ray examination and AP skull lateral X-ray examination. On panoramic examination and the AP skull lateral X-ray, a dentoalveolar bone discontinuity in the lower jaw area can be seen. *Panoramic radiography* is a supporting tool that can be used to diagnose a case, such as the presence of a jaw fracture, symmetric or asymmetric evaluation of the TMJ, or knowing the depth of caries. Panoramic radiographs provide wide-angle views of the maxilla, mandible, and surrounding structures. This picture includes the neck, temporomandibular joints (TMJ), zygomatic arches, maxillary sinuses, nasal cavities, and orbits, although doing so with less sharpness and detail than meets the eye.[13]

Many things can cause Trauma and dentoalveolar fractures in children. In this case, the patient fell on his face hitting the asphalt, which may cause traumatic injury to the teeth and their supporting structures. The panoramic view confirmed this condition. Dentoalveolar fractures are discontinuities in the tooth and alveolar structures that may occur separately or together,[14] characterized by displacement of the dentoalveolar segments, tooth mobility, occlusal disturbances, and hematomas to the adjacent oral mucosa.[5,15] A bone discontinuity and anterior dentoalveolar segmentation of the lower jaw area 32, 42 leads to dentoalveolar fracture.[5,16] However, in this case, the fracture was caused by accident, with injuries generally involving the maxillary anterior segment (4%-91%) followed by the anterior mandible.[5,17]

Decision-making in fracture management in children is more challenging than in adult patients because it considers jaw size, the growth center of the bone, and unerupted permanent teeth. The goal of fracture treatment in children is to return the bone structure to its original position as early as possible with minimally invasive treatment and result in restoration of the occlusion with aesthetics and minimum functional disturbance.[4,5] Fracture treatment involves reduction, immobilization, and fixation involving adjacent teeth. This fixation is achieved through a variety of techniques.[6,18] Fixation plays an essential role in bone healing in alveolar fractures, with the proviso that the fixation must be rigid to allow proper bone healing. The key to adequate immobilization is adding at least 3-4 stable teeth as anchors on either side of the fractured alveolar segment;[17] in this has been revisedcase, there was a fractured segment in regions 32-42, so wiring was performed in regions 36-46. The immobilization method with tooth splinting and wire ligature is effective in treating the dentoalveolar segment with minimal displacement

Children have high osteogenic potential and great potential for remodeling, which allows successful non-surgical management with a conservative approach,[19] so that the patient was treated with Risdon wiring. This technique is done because it considers the patient's age, still in the mixed dentition period. In pediatric patients with mixed dentition, the height of the primary tooth contour is below the gingival level; besides, the short and rounded crowns of primary teeth make it difficult to achieve retention of the arch bar. Thus, the application of the arch bar cannot be carried out. In addition, arch bars also provide lower stability due to the resorption of primary tooth roots and immature permanent tooth root formation,[5,6,19] for this reason, treatment with Risdon wiring is carried out as an alternative to arch bars for mandibular fractures that require fixation.[6] Risdon wiring provides a sturdy yet thin construction that adapts well to primary teeth. [19]

In addition to wiring, tetragram injection is given as tetanus prophylaxis. The patient is given amoxicillin to reduce the risk of infection because of its bactericidal activity.[20] Pain control is achieved by giving paracetamol. Patients are given oral hygiene instructions to maintain oral hygiene during the healing period and undergo a soft diet. Oral hygiene instructions were given in cleaning the wound area with a soft brush or cotton swab and using 0.12% chlorhexidine gluconate mouthwash after meals twice daily for

one week. This activity prevents the accumulation of plaque and debris and reduces bacterial counts.[21] Patients were also given hyaluronic acid gel. in the intraoral post-suturing area as a supportive therapy to reduce postoperative pain, infection, and healing. Besides, hyaluronic acid gel plays a role in maintaining the integrity and elasticity of connective tissue.[21,22] Patients are also given chloramphenicol zalf in the extraoral post-suturing area as a topical antibiotic for reducing exposure to microbial contaminants after surgical procedures.[23] Patients were planned for panoramic X-rays to ensure treatment efficacy and prevent further complications.

Conclusion

Emergency treatment of dentoalveolar fractures in children includes care of soft tissue injuries and fixation simple of the fracture. The choice of fixation method for immobilizing dentoalveolar fractures in pediatric patients requires specific criteria because they must consider anatomical variations and consider the growth of bones and teeth. *Risdon wiring* is a simple method that can be used as a fixation method for immobilizing dentoalveolar fractures in mixed dentition patients.

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