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Segmental alveolar process fracture involving primary incisors: treatment and 24-month follow up

CASE REPORT

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Abstract – Alveolar process fractures are particularly complicated by the developing jaws, the presence of tooth germs and the eruption of permanent teeth. The present report describes the management and 24-month follow up of a segmental mandibular alveolar process fracture involving laterally luxated primary incisors. A 5-year-old boy was admitted to the clinic 3 h after a fall accident, which resulted in the fracture of the mandibular alveolar process with substantial dislodgement of the buccal cortical bone and right primary incisors. Emergency treatment consisted of fracture reduction in the dislodged bone and repositioning of the primary incisors, followed by placement of a semi-rigid splint between mandibular canines and suturing of soft-tissue lacerations. The splints were removed at the end of week 3, and the affected primary incisors remained asymptomatic until natural exfoliation. At 24 months, Eruption of the permanent successors was almost complete in the absence of any sequel from prior trauma.

Dental trauma is a significant problem that may have serious medical, esthetic, and psychological consequences on children and their parents (1, 2). Epidemiological data show that approximately 30% of children under the age of 7 years experience injuries to one of their primary incisors (3, 4), and about 40% of children have their first contact with the dentist because of a traumatic injury (5). Reports also indicate that approximately 50% of children have their teeth affected by traumatic injuries throughout the school period (6).

Injuries to the primary dentition may present in isolation to the hard dental tissues and pulp, or in association with the periodontal tissues, soft tissues, and the alveolar bone (7). Children with primary teeth are most frequently affected by luxation injuries (3, 8–11). Among these, lateral luxation is a serious type of injury, where the tooth is displaced out of its normal position (7). Traumatic displacement of primary teeth may also be associated with an alveolar fracture. In a large sample size of traumatized primary incisors, Borum and Andreasen (3) reported that about 50% of the traumatic injuries presented with varying degrees of trauma to the bone, with the facial lamella and alveolar process fractures contributing to 23.9% and 4.4% of the total, respectively. Although laterally luxated primary incisors may spontaneously return to their original position (3), displacement of teeth associated with an alveolar fracture necessitates repositioning and splinting as emergency interventions (3, 7).

The management of injuries to the primary dentition is particularly complicated by the potential for collateral damage to the developing permanent tooth buds (3, 7, 12, 13). Such concern may be more pronounced when an alveolar fracture is involved. Interestingly, while traumatic injuries of the mandibular primary incisors and canines are reported to be considerably less frequent compared with their maxillary counterparts (14), fractures to the mandible and mandibular alveolar bone are more commonly encountered than any other maxillofacial structure (15). For this reason, alveolar fractures to the mandibular region are especially important to understand because of the potential complications related to tooth eruption, alveolar development, and occlusion, as well as facial and psychological factors specifically related to childhood. This paper describes the treatment and 2-year follow up of a segmental mandibular alveolar process fracture involving primary incisors in a 5-year-old boy.

Case report

A 5-year-old boy was admitted to the pediatric dentistry clinic 3 h after a fall accident at the schoolyard. Reportedly, an emergency examination had been made by a hospital pediatrician, who diagnosed the patient to

Fig. 1. Intraoral views of the patient. Note the extent of dentoalveolar dislodgement and soft-tissue laceration.

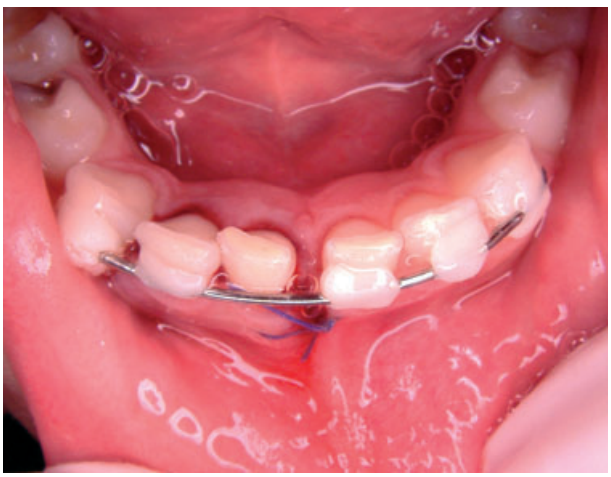

Fig. 2. View of the teeth after fracture reduction and splinting.

be free of neurological and general physical symptoms, and further referred the patient for the management of dentoalveolar trauma. The patient was in excellent health with no remarkable past medical history.

Clinical examination revealed a segmental fracture of the mandibular alveolar process with substantial frontal dislodgement of the labial cortical bone, involving right primary incisors (Fig. 1). The labial attached gingiva had been lacerated at the midline with an approximately 2 mm extension into the mucosa. The corresponding lingual segment of alveolar bone was slightly mobile on palpation, but did not appear to be dislodged as with the labial region. Because the child was extremely apprehensive during taking of periapical radiographs, a proper initial radiograph could not be obtained.

Upon approval of the patient's parents about the treatment plan, a local anesthetic (4% articaine HCl with 1:100 000 epinephrine) was administered and the soft-tissue lacerations were irrigated with sterile saline and thoroughly inspected to ensure the absence of any foreign bodies. Thereafter, the dislodged bone and primary incisors were gently repositioned. A semi-rigid, round 0.5-mm orthodontic wire splint was bonded to the teeth between primary canines using acid-etch composite resin. Owing to unfavorable isolation conditions, the right central incisor could not be secured to the splint (Fig. 2). Following suturing of the soft-tissue laceration, the cooperation was re-established and the child allowed for taking radiographs which confirmed correct fracture reduction along with repositioning of dislodged teeth (Fig. 3). The patient was prescribed amoxicillin and ibuprofen and was scheduled for regular control visits.

Soft-tissue healing was observed at the second-week recall. The splints were removed at the end of week 3, and the affected primary incisors remained asymptomatic until natural exfoliation. Incomplete eruption of the permanent incisors was observed at 24 months (Fig. 4). Apparently, the trauma had not affected the permanent successors, as evidenced by the absence of any sequel from past trauma (Fig. 5). The patient has been attending annual control visits.

Fig. 3. Periapical radiograph of teeth and surrounding hard tissues following placement of the splint.

Discussion

Compared with adults and adolescents, the incidence of pediatric maxillofacial fractures is generally low (15, 16), owing to the protective anatomic features of a child's face which decrease the incidence of facial fractures (16). On the other hand, Borum and Andreasen (3) have indicated that traumatic injuries of primary incisors involving the alveolar bone are not uncommon

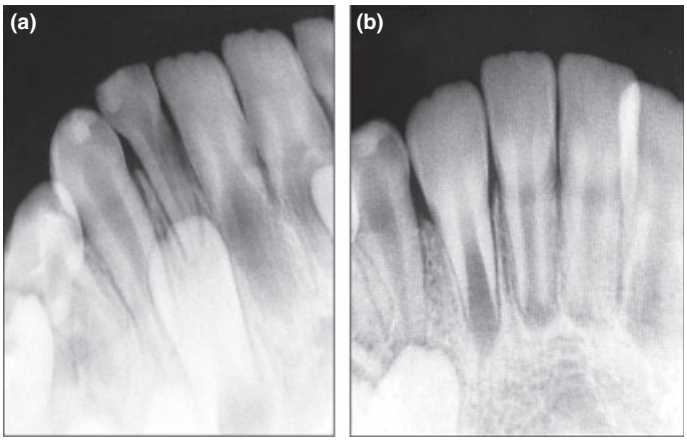

Fig. 4. Periapical radiographs of teeth 18 (a) and 24 (b) months post-trauma.

Fig. 5. Intraoral views of the patient 24 months post-trauma. The permanent successors have started erupting uneventfully.

(i.e., 28.3%). At later ages, fractures of the alveolar bone may also account for as high as 32% of all childhood facial fractures (15), indicating that this characteristic fracture pattern should be considered as a common type of injury (15, 16). In the present case, the Class I skeletal profile of the patient cannot by itself explain the mechanics of trauma that led to the labial dislodgement of the mandibular incisors along with alveolar bone. Presumably, the patient's mouth was open with the mandible protruded during the fall; and upon sudden closure of jaws, the maxillary incisors forced the lower anterior segment to displace labially.

Dentoalveolar fractures may be associated with a mandibular fracture. In some cases, there may be just hairline fracture to the condyle that may have been missed, and one of the consequences of that would be temporomandibular joint ankylosis. Because a periapical radiograph would not be adequate to rule out other possible fractures, thorough radiographic evaluation of the jaws is essential. In alveolar fractures, the tooth in the affected segment is mobile and usually displaced (7). Emergency management of alveolar fractures requires manually repositioning the segment of fractured bone and displaced teeth back into proper alignment (7, 17). Before repositioning, all intraoral lacerations must be cleaned, thoroughly inspected and washed to ensure there is no foreign material (17). Thorough inspection of lacerations is also important to reveal injuries to the underlying structures (16). Reduction in the fractured alveolar segment and associated teeth is gently performed under local anesthesia (16). Concern for minimal manipulation is mandated, because of the small size of the jaw, the existing active bony growth centers, and the existence of permanent tooth buds located in great proximity to deciduous teeth (15, 16, 18). Repositioning should be followed by splinting of teeth with a semi-rigid splint and suturing of soft-tissue lacerations, if present (7, 19). According to the IADT guidelines, the splints should be maintained for 3–4 weeks (19). In fact, even for complex mandibular fractures, 2–3 weeks of immobilization may be all that is required for optimal healing (20). In the present case, the splint was removed by the end of the third week, as both the alveolar segment and the affected primary teeth showed sufficient stability.

In primary tooth injuries, the severity of sequel to permanent successors depends on the age of the child at the time of injury, the grade of root resorption of the traumatized deciduous tooth, the type and extension of the injury, and the developmental stage of the successor at the time of injury (15, 21–23). The greatest risk for injuries to the permanent teeth exists if the primary teeth encounter trauma before 3 years of age, when the permanent tooth crowns are calcifying (3, 12, 13). In the present case, the trauma occurred at the age of 5, which minimized the risk of developing sequel to the permanent incisor crowns. However, root dilacerations and ectopic/delayed eruption of permanent teeth may also present as sequel to primary tooth injuries (12, 21–23). The absence of such findings in the present case may be because of the successful outcome of fracture reduction, coupled with the uneventful healing of the affected primary incisors. Undoubtedly, compliance of the patient and parents to maintain the medication, hygiene, and diet instructions should also be considered as a contributory factor to the favorable long-term prognosis (7, 12).

There is no conclusive epidemiologic data regarding the prognosis of primary and permanent teeth affected by childhood alveolar fractures. In the present case,

adherence to the recently published IADT guidelines resulted in a favorable treatment outcome for both the alveolar fracture and the affected teeth. Thus, until more data on the healing consequences of alveolar fractures are available, the IADT guidelines may offer a conservative treatment approach with predictable outcomes.

References

1. Rocha MJ, Cardoso M. Survival analysis of endodontically treated traumatized primary teeth. Dent Traumatol 2007;23:340–7.
2. Andreasen JO, Andreasen FM, Andersson L. Textbook and color atlas of traumatic injuries to the teeth, 4th edn. Copenhagen: Munksgaard; 2007.
3. Borum MK, Andreasen JO. Sequelae of trauma to primary maxillary incisors. I. Complications in the primary dentition. Endod Dent Traumatol 1998;14:31–44.
4. Orders ML, Koch G. Developmental disturbances in permanent successors after injuries to maxillary primary incisors. Eur J Pediatr Dent 2001;2:165–72.
5. Lygidakis NA, Marinou D, Katsaris N. Analysis of dental emergencies presenting to a community paediatric dentistry centre. Int J Paediatr Dent 1998;8:181–90.
6. Andreasen JO, Ravn JJ. Epidemiology of traumatic dental injuries to primary and permanent teeth in a Danish population sample. Int J Oral Surg 1972;1:235–9.
7. Flores MT. Traumatic injuries in the primary dentition. Dent Traumatol 2002;18:287–98.
8. Llarena del Rosario ME, Acosta AV, Garcia-Godoy F. Traumatic injuries to primary teeth in Mexico City children. Endod DentTraumatol 1992;8:213–4.
9. Onetto JE, Flores MT, Garbarino ML. Dental trauma in children and adolescents inValparaiso, Chile. Endod Dent Traumatol 1994;10:223–7.
10. Perez R, Berkowitz R, McIlveen L, Forrester D. Dental trauma in children: a survey. Endod Dent Traumatol 1991;7:212–3.
11. Soporowski NJ, Allred EN, Needleman HL. Luxation injuries of primary anterior teeth: prognosis and related correlates. Pediatr Dent 1994;16:96–101.
12. McTigue DJ. Managing injuries to the primary dentition. Dent Clin North Am 2009;53:627–38.
13. Altun C, Cehreli ZC, Guven G, Acikel C. Traumatic intrusion of primary teeth and its effects on the permanent successors: a clinical follow-up study. Oral Surg Oral Med Oral Pathol Oral Radiol Endod 2009;107:493–8.
14. Choi SC, Park JH, Pae A, Kim JR. Retrospective study on traumatic dental injuries in preschool children at Kyung Hee Dental Hospital, Seoul, South Korea. Dent Traumatol 2010;26:70–5.
15. Iida S, Matsuya T. Paediatric maxillofacial fractures: their aetiological characters and fracture patterns. J Craniomaxillofac Surg 2002;30:237–41.
16. Aizenbud D, Hazan-Molina H, Emodi O, Rachmiel A. The management of mandibular body fractures in young children. Dent Traumatol 2009;25:565–70.
17. Ceallaigh PO, Ekanaykaee K, Beirne CJ, Patton DW. Diagnosis and management of common maxillofacial injuries in the emergency department. Part 5: dentoalveolar injuries. Emerg Med J 2006;24:429–30.
18. Smartt JM Jr, Low DW, Bartlett SP. The pediatric mandible: I. A primer on growth and development. Plast Reconstr Surg 2005;116:14e–23e.
19. Flores MT, Malmgren B, Andersson L, Andreasen JO, Bakland LK, Barnett F et al. Guidelines for the management of traumatic dental injuries. III. Primary teeth. Dent Traumatol 2007;23:196–202.
20. Smartt JM Jr, Low DW, Bartlett SP. The pediatric mandible: II. Management of traumatic injury or fracture. Plast Reconstr Surg 2005;116:28e–41e.
21. Sennhenn-Kirchner S, Jacobs H. Traumatic injuries to the primary dentition and effects on the permanent successors – a clinical follow-up study. Dent Traumatol 2006;22:237–41.
22. Da Silva Assunção LR, Ferelle A, Iwakura ML, Cunha RF. Effects on permanent teeth after luxation injuries to the primary predecessors: a study in children assisted at an emergency service. Dent Traumatol 2009;25:165–70.
23. do Espírito Santo Jácomo DR, Campos V. Prevalence of sequelae in the permanent anterior teeth after trauma in their predecessors: a longitudinal study of 8 years. Dent Traumatol 2009;25:300–4.