

Conservative management of root-fractured primary incisor – case report

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SUMMARY

Most frequent trauma to primary dentitions are injuries to the supporting tissue i.e. luxations, but root fractures are relatively uncommon. The difference in the trauma pattern favoring luxation rather than fracture has been found to be typical for the primary dentition, since the elasticity of the alveolar bone surrounding the primary teeth is high and primary tooth held in alveolar socket is less strong. Incidence of root fractures increases at the age of 3-4 years where physiologic root resorption has begun, thereweakening the root. Traumatic injuries to the primary dentition present special problems and the management is often different as compared with the permanent dentition. Because of potential sequelae of trauma to primary teeth, a treatment method that minimizes any additional risks of further damage to the permanent successors should be selected. The report presents a case of 3.5 year-old boy after traumatic injury – extrusion of tooth 51, which required surgical treatment, and apical third horizontal root fracture of tooth 61 treated conservatively. Written consent from subject's parents/subject's legal guardians was obtained. Root-fractured primary tooth has been followed clinically and radiographically for 3.5 year, till advanced root resorption. Presented case and cases described in cited literature demonstrate that conservative treatment of root-fractured primary teeth is a favorable method of the treatment that allows the teeth to function naturally until the term of physiological resorption and exfoliation.

INTRODUCTION

In preschool children, head and facial injuries make up 40% of all injuries and oral injuries are covering as much as 18% (1). Andreasen et al. (2) report that one third of 5 year-old children have history of dental trauma, and a large proportion of minor traumatic injuries to deciduous teeth are not reported and not taken into account in the statistics (3). Predominantly deciduous maxillary central incisor teeth are involved, lateral incisors to a less degree and canines (4). The peak prevalence of injuries to milk teeth occurs at 2-3 years of age, when motor coordination

is still during development, but increased physical activity in children is observed (5). Most frequent trauma to primary dentitions are injuries to the supporting tissue i.e. luxations, which account for between 21 and 81% of all dental trauma (3). Multiple luxation injuries and trauma to surrounding soft tissues are mainly reported in children 1-3 years of age and are typically as a result of falls (1). Whereas, isolated root fractures are rare entity among trauma to primary teeth. According to Andreasen and Andreasen (6), in primary dentition 2-4% of dental traumatic injuries were reported as root fractures. Similarly,

Walczak et al. study (4) report that root fractures were observed in 2.46% of dental trauma in children under the age of 6 years. The difference in the trauma pattern favoring luxation rather than fracture has been found to be typical for the primary dentition, since the surrounding bone is less dense and less mineralized and elasticity of the alveolar bone surrounding the primary teeth is high, also primary tooth held in alveolar socket is less strong. This is also due to teeth anatomy as deciduous teeth have shorter crowns than counterpart permanent teeth and roots have smaller sizes (3).

Incidence of root fractures increases at the age of 3-4 years where physiologic root resorption has begun, thereby weakening the root (7). Root fractures are defined as fractures involving dentin, cementum, and pulp, with or without displacement of coronal fragment of the root. In a clinical examination, the coronal fragment is usually mobile and dislocated, transient pink or gray discoloration of the crown may appear (2, 8). Root fractures in the primary dentition are usually located at mid-root or in the apical third, with radiolucent lines separating the root into two or more fragments (8, 9).

CASE REPORT

A 3-year-old boy was brought by his mother to the Department of Paediatric Dentistry Medical University of Łódź on 20th November, 2014, complaining of pain and increased mobility of the central incisors in the maxilla following dental injury on the day of reporting. Written consent from subject's parents/subject's legal guardians was obtained. The mother of the child reported that the injury was caused by falling to the floor while playing at home. A first aid in the form of stopping of bleeding from the injured upper lip was given immediately after the trauma. Intraoral examination revealed upper lip edema and the presence of a wound of the upper lip, but no suturing was required. In the intraoral examination, hematoma of the alveolar mucosa in the region of primary tooth 51, extrusion and palatally displacement of the tooth were found. The right central maxillary incisor exhibited vertical and horizontal mobility ≥ 2 mm (class III mobility). Also, fracture of the crown, involving enamel, and increased mobility of the left maxillary incisor, 61 were found. Radiographic examination revealed a horizontal fracture on the left central incisor at the apical third of the root, increased periodontal ligament space apically due to severe extrusion of tooth 51 and shortening of the tooth on X-ray due to its palatal displacement (fig. 1). Since severe displacement in the fully formed primary tooth 51, extraction was the treatment of choice, what was in accordance with IADT (The International Association of Dental Traumatology) guidelines for management of traumatic injuries to primary teeth (1).

The patient was referred to the Surgical Department, where the tooth 51 was extracted. Due to the extensive

mobility and extrusion, the procedure was performed under topical anesthesia.

A follow-up appointment was set, the patient was instructed to remain on a soft diet for 2 weeks and a gentle brushing with a soft brush was recommended. During the control visit on 24th November, 2014 the tooth mobility was reduced, crown color was normal and there were no changes on alveolar mucosa in the region of tooth 61. The patient's mother was informed about the need of clinical and radiological follow up. Also, at 8 weeks, the tooth 61 was asymptomatic, physiological mobility and no crown discoloration and normal oral mucosa were noted. Radiographic examination showed resorption on distal surface of apical fragment, rounded margins of coronal fragment of the root, and no evidence of any inflammatory process in the affected tooth (fig. 2). Presence of root fracture healing with calcified tissue was found at the 8 month follow-up (fig. 3).



Fig. 1. Initial radiograph of teeth 51 and 61, showing extrusion of tooth 51 and a horizontal root fracture of tooth 61 at the apical third

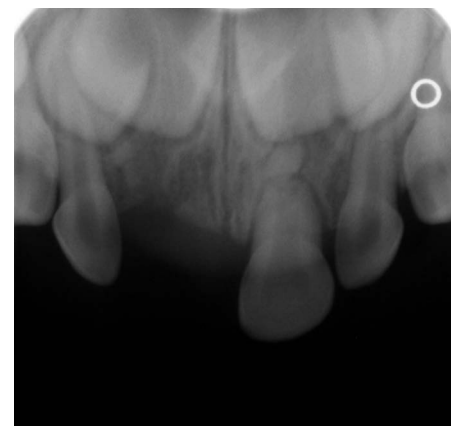


Fig. 2. Periapical radiograph at 8 week follow-up showing atypical resorption of apical fragment, and rounded margins of coronal fragment of the root 61

During recall appointments, every 6 months, the tooth was asymptomatic, there was no sign of crown discoloration or increased tooth mobility, and no tenderness to percussion. Two years post injury a marked rounding of both coronal and apical fragments of the root were noticed on periapical radiograph (fig. 4). At 3.5 year follow-up the tooth was asymptomatic, and demonstrated normal color, but an increase mobility of tooth 51 was found in intra-oral examination, recognized as mobility due to normal tooth resorption, adequate to the child age (fig. 5). Radiographic examination confirmed the diagnosis of advanced, normal root resorption of the tooth 61 (fig. 6).

the management of root fracture may present a challenge for clinicians. Many of horizontal root fractures located in the apical third, are asymptomatic and remain undiagnosed. Young children are often difficult to examine and treat because of the lack of cooperation and fear (1, 10). Traumatic injuries to the primary dentition present special problems and the management is often different as compared with the permanent dentition (1). Beside child’s maturity and ability to cooperate with dentist, also the time for shedding of the injured tooth, and occlusal conditions are all important factors that influence treatment selection (1). It is also important to keep in mind that there is a close relationship between the apex of the root of the injure primary tooth and the permanent successor germ. Because of potential sequelae of trauma to primary teeth, dentists should select a treatment method that minimizes any additional risks of further damage to the permanent successors (1).

DISCUSSION

In primary dentition, root fractures are relatively uncommon among dental traumas, and the diagnosis, as well as



Fig. 3. Radiograph after 8 months showing presence of root fracture healing with calcified tissue



Fig. 5. Image taken at 3.5 year recall showing normal color of tooth 61



Fig. 4. Radiograph after 2 years showing a marked rounding of both coronal and apical fragments of the root 61



Fig. 6. Radiograph taken at 3.5 year after injury showing continuously developing permanent incisors and almost completed resorption of tooth 61

The management of root fracture of primary teeth is determined by the presence of coronal fragment dislocation. If coronal fragment is not displaced the injured tooth can be left untreated and only follow-up is indicated (1, 2). Teeth with root fracture need to be monitored by clinical and radiographic examination post trauma, at six to eight weeks, at one year and then annually until the permanent tooth erupts (1, 8).

According to Andreasen et al. (2), root fracture with minimal displacement of coronal fragment can be left untreated, since it will resorb physiologically, with the expected time range. If coronal fragment is displaced the treatment options include: conservative treatment – reposition of coronal fragment and splinting, or surgical treatment – extraction of coronal fragment only, and apical fragment should be left for physiological resorption (1, 8). Gaining child's cooperation during treatment is the factor that determines the possibility of conservative treatment (11).

In teeth affected by horizontal root fracture the apical fragment is always left *in situ*, and remains uninjured (2).

For this reason, unlike intrusion, root fracture injury itself and the attempt to reposition a displaced coronal fragment are not expected to compromise development of the permanent successor (9). So far, none unfavorable outcome for the permanent teeth secondary to primary tooth root fractures has been reported in the literature (9).

Presented in the literature cases of conservative treatment of primary teeth with horizontal root fractures, that included observation of injured teeth without dislocation of coronal fragment or reposition of dislocated coronal fragment and splinting, are tabulated in table 1 (9, 11-13). In all shown in table 1 cases during follow up injured teeth were asymptomatic with no sign of crown discoloration.

In the presented case of root fracture there was resorption on distal surface of apical fragment shown in radiographic examination.

According Nam et al. (13) resorption of apical fragment observed in intra-alveolar root fracture of primary

Tab. 1. Review of the cases of horizontal root fractures of primary central incisors

Author, year	Age	No of affected tooth and description of root fracture	Management	Follow up
Liu et al., 2013	3.5 years	51 – apical third root fracture 61 – middle third root fracture with extrusion by 1 mm and displacement in a palatal	Reposition of tooth 61 and splinting with orthodontic brackets for 3 months	2.5 years – till eruption of permanent successor
Gadicherla and Devi, 2016	4 years	51 – apical third root fracture	Observation	4 months
Richa and Kumar, 2017 Case 1	4 years	51 – apical third root fracture and 61 extrusion by 1 mm	Reposition and stabilization with semi-rigid wire composite splint for 2 months	3 years – till eruption of permanent successor
Case 2	4 years	51 – apical third root fracture	Stabilization with semi-rigid wire composite splint for 4 weeks	2 years till advanced physiological resorption of the root on X-ray
Nam et al. 2017 Case 1	16 months	51, 61 – middle third root fracture with displacement of coronal fragment	Reposition and stabilization with semi-rigid wire composite splint (repetitive trauma after 2 years)	4 years till advanced physiological resorption of the root on X-ray
Case 2	44 months	51, 61 – apical third root fracture (without any displacement of coronal fragment)	Observation	1 year complete resorption of apical root parts on X-ray
Case 3	3 years	61 – apical third root fracture with slight lingual displacement of coronal fragment	Since the root-fractured tooth exhibited minimal incisal interference, observation alone was performed (repetitive trauma at 29 months – observation)	30 months, till complete loss of the apical root part on X-ray

teeth is an example of atypical resorption, which is distinguished from pathologic root resorption by peripheral circumferential resorptive pattern. ARR can be categorized into following patterns: type I, circumferential without loss of total root length; type II, conically shaped apical reduction (“ice-cream cone”); type III, rounded or capped reduction of apical half of root; type IV, combination of types I and II (14). The repetitive orthodontic forces due to parafunction in a form of digit sucking was previously reported as only factor of ARR. However, Holan et al. (15) observed that ARR in primary dentitions is also associated with history of traumatic dental injuries. Similarly, Mortelitti and Needleman (16) and Needleman (10) reported that children with a positive history of both trauma to the incisors and oral habits had a statistically higher prevalence of ARR than those without either finding. Nam et al. (13) presented 10 cases of root-fractured primary teeth, with radiographic presence of ARR at 1 month to 22 months follow-up period. None of patients experienced oral parafunction, such as finger sucking. ARR was found in root fractures without dislocation, as well as in fractures with coronal fragment dislocation, after reposition and teeth splinting with semi-rigid wire composite splint.

According to Nam et al. (13) ARR should be considered as a new type of healing process following root fractures in primary teeth, because of the characteristic of ARR and the fact that teeth vitality appeared to be maintained, and neither discontinuity of lamina dura nor any evidence of radiolucency was visible on X-ray (Nam). Data from literature indicate that in root-fractured primary teeth physiological resorption of coronal fragment and the eruption of permanent successor occur on time, and no developmental defect of the permanent tooth are observed (9, 11, 12).

CONCLUSIONS

In conclusion, presented case and cases described in cited literature demonstrate that conservative treatment of root-fractured primary teeth is a favorable method of the treatment that allows the teeth to function naturally until the term of physiological resorption and exfoliation. It also reduces the patient’s stress associated with tooth extraction and the risk of complications associated with premature loss of the primary tooth. In the presented case, the maintenance of tooth 61 was particularly important due to premature tooth loss 51.

CONFLICT OF INTEREST

None

CORRESPONDENCE

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