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**Treatment after inadequate immediate replantation of accidentally extracted immature mandibular premolar during primary molar extraction**

**Short title: Replantation of accidentally extracted tooth**

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### **Responsibilities of the authors**

The responsibility of Jelena Juloski was to treat the patient, follow-up the patient, contribute to the idea and the writing of the manuscript, and proofread the manuscript.

The responsibility of Maja Dimitrijevic was to assist in the treatment of the patient, follow-up the patient, photo document the case, and write the manuscript.

The responsibility of Jovana Juloski was to contribute to the design of the manuscript, proofread the manuscript, prepare the manuscript for submission, submit the manuscript and correspond with the Journal.

The responsibility of Ivana Radovic was to make a treatment protocol described in the case report, treat the patient, and proofread the manuscript.

### **Conflict of interest:**

The authors declare no conflicts of interest.

### **Treatment after inadequate immediate replantation of accidentally extracted immature mandibular premolar during primary molar extraction**

#### **Abstract**

During extraction of the primary mandibular right second molar in an 11-year old girl, the unerupted second premolar was accidentally extracted. Clinical and radiographic examination showed that the immediately replanted immature premolar was not oriented and positioned correctly. Four hours later, treatment consisted of manual extrusion of the permanent tooth bud, rotation and gentle repositioning into its original position. Adequate replantation was

confirmed by a post-operative radiograph. After two years and four months clinical examination revealed normal, healthy appearance of the replanted tooth, no sensitivity to percussion, no tenderness to palpation, and a slight response to a cold pulp sensibility test. A radiograph showed completely developed root with closed apical foramen, slightly irregular root morphology and shorter root length, complete obliteration of the pulp, and no signs of periapical pathosis.

**Keywords:** tooth extraction, tooth replantation, unerupted tooth.

## **Introduction**

Extraction of primary teeth is a very common procedure in pediatric dentistry.<sup>1</sup> One of the most severe complications, especially when extracting primary molars, is the unintentional extraction of the developing permanent tooth. In the dental literature, only three reports presenting such cases have been published.<sup>2-4</sup> All three reports described unintentional, complete extraction of a developing premolar that occurred during a primary molar extraction and its immediate replantation. Successful outcomes for all cases were reported, emphasizing the importance of immediate repositioning and early developmental stage of the root of the accidentally extracted premolar. So far, there is no evidence regarding other possible clinical scenarios such as inadequate or delayed replantation.

The present case report describes the delayed replantation and a 28-months follow-up after inadequate immediate replantation of an accidentally extracted mandibular second premolar that occurred during the extraction of the primary second molar.

## Case report

An 11-year old girl was referred to the university clinic by the pediatric dentist from a community health centre for emergency treatment after a primary tooth extraction. The patient and her mother reported that during the extraction of the primary mandibular right second molar, the tooth bud of the permanent premolar was accidentally extracted. They claimed that the tooth bud was immediately returned back into the extraction socket. The patient was asked to bite on a folded piece of sterile gauze and was referred to the university clinic.

The patient presented at the university clinic approximately four hours after the incident and she brought the extracted primary mandibular right second molar in a piece of gauze. The tooth had been extracted completely, the crown was intact, both roots showed minimal resorption of the apices and no fractures of the roots were visible. Deep indents were evident on the inner surfaces of both roots (Figure 1). Intraoral clinical examination revealed that the replanted premolar was covered with the soft tissue of the dental follicle and it was extruding from the extraction socket (Figure 2). Since the patient did not have any pre-operative radiographs, an intraoral periapical radiograph was obtained. The radiograph showed that the unintentionally extracted and replanted second premolar had almost one-half of the root developed, was rotated 90 degrees in relation to its long axis, with the buccal cusp oriented distally, and it was not replanted deep enough into its original position (Figure 3).

After clinical and radiographic examination, it was decided that the tooth should be removed and replanted back into its original position. The patient's mother gave informed consent for the proposed treatment. An inferior alveolar nerve block and an infiltration for the long buccal nerve were administered. First, the tooth was gently manually extruded out of the socket with the operator's left and right index fingers, then rotated 90 degrees

counterclockwise, moving the buccal cusp toward the buccal aspect of the socket. It was then gently pushed back into the socket with the right index finger as close as possible to its assumed original position. Two sutures were placed to ensure fixation (Figure 4). A post-operative periapical radiograph showed that adequate replantation had been achieved (Figure 5). At a follow-up appointment one week later the patient did not have any complaints. The extraction wound was healing and the sutures were removed. The next appointment was scheduled for the following month. However, the patient did not come back to the clinic for a regular check-up until one year and ten months later.

The patient, now 13 years old, reported that the replanted premolar had been asymptomatic since her previous visit, and she had no memory of any problems regarding the tooth eruption. Clinically, normal and healthy appearance of the right second premolar in the lower arch was observed (Figure 6). The tooth showed no sensitivity to percussion and no tenderness of the surrounding tissues to palpation. Pulp sensibility was assessed with a cold pulp test and the tooth had a very slight reaction. A radiographic examination (Figure 7) revealed that the root was completely developed and the apical foramen was closed. The morphology of the root was slightly irregular, especially in the middle and the apical thirds. The length of the root was a little shorter than that of the adjacent premolar. Almost complete obliteration of the pulp chamber and the root canal were noticed. There were no signs of periapical pathosis.

Six months later (i.e. 28 months post-operative) at the next follow-up appointment, the tooth continued to be asymptomatic, healthy and functional. The tooth had again a very slight reaction to a cold pulp test. The radiograph appearance was very similar to the previous one, with complete obliteration of the root canal (Figure 8).

## **Discussion**

A specific set of circumstances led to the unintentional permanent tooth extraction in this case. There were very deep indents on the inner surfaces of the roots of the extracted primary molar which corresponded to the shape of the crown of the premolar. These suggest that the crown of the permanent successor was tightly encircled by the roots of the primary predecessor. Since the relationship between the primary and permanent teeth was not radiographically assessed pre-operatively, their simultaneous extraction was probably unavoidable. Also, it could be considered uncommon that, at the age of 11 in a female, the roots of the primary mandibular second molar were almost not resorbed at all. Most likely this was the reason why an easy and routine extraction of the primary molar was expected. However, clinicians should be aware of the wide variations in eruption times for canines and premolars.<sup>5</sup>

The significance of a pre-operative radiograph prior to extraction of primary teeth should not be underestimated. Based on the morphology of the primary roots and the position of the permanent tooth on the radiograph, the clinician should make a decision on the extraction technique and whether sectioning of the primary roots might be necessary in order to protect the underlying developing tooth.<sup>6,7</sup> However, a sectioning procedure may also be risky if the crown of the successor tooth is near the furcation of the primary tooth's roots. Using excessive or uncontrolled pressure with elevators, especially in the furcation area, should be avoided, since accidental extrusion<sup>8</sup> and crown dilaceration<sup>9</sup> of permanent teeth have been described as possible complications.

As with all previously published cases,<sup>2-4,8</sup> the present case was considered successful based on the signs of pulp healing, periodontal healing and continued root development.<sup>10-12</sup> All the necessary requirements for a successful outcome were present: the root was at an early stage of the development, the apical foramen was wide, the tooth was out of the socket for a very short period of time (probably less than a minute) and between the two

interventions, the tooth was kept in the extraction socket which can be considered as an ideal storage medium.

The diagnosis of revascularization of the premolar was made on the basis of radiographic signs of pulp canal obliteration, which is considered to be the most frequent mechanism by which the pulps of avulsed immature permanent teeth heal after replantation.<sup>10,13</sup> Other cases of immediately replanted premolars have also reported pulp canal obliteration.<sup>2,4,8</sup> Based on the follow-up radiographic images, showing an apparent bone-like deposit in the middle third of the root, it appears that the development of this replanted tooth has occurred in two phases. The first phase appears to have been bone ingrowth into the incompletely developed replanted premolar and the second phase the development of the mature apical foramen within residual Hertwig's epithelial root sheath. While the reasonable expectation in long term will be calcification of the central section, it is important that this replanted tooth is monitored for long period of time in case there may be the potential for resorption rather than calcification in the central area. Further evidence of the proposed two phase response can be noted in the residual root canal above the central area, whereas the second phase development has a definable root canal only from the central section to the mature apical foramen.

Absence of external root resorption, as well as no sensitivity to percussion and palpation, led to the conclusion that the periodontal ligament cells remained viable and allowed periodontal healing.<sup>11,14</sup> Finally, complete root development and the closed apical foramen suggest that Hertwig's epithelial root sheath was not completely damaged and that it maintained its regenerative potential,<sup>12,15,16</sup> despite the tooth being removed from its developmental crypt twice. The irregular root shape and length could be considered a minor consequence of the acute trauma that affected root development at the moment of the accidental extraction.



## **Conclusion**

Pediatric dentists should be well-trained for situations that require urgent action. Even though this particular case could be considered successful, the second intervention could have been avoided if the pediatric dentist had performed the immediate replantation correctly. Different outcomes could have been expected, considering that the tooth was out of its socket on two separate occasions. This case report emphasizes the importance of the pre-operative radiograph, even when an easy extraction of a primary molar is expected. Additionally, in case of unintentional extraction of a permanent tooth, the correct orientation and adequate replantation into its original position is of utmost importance. Nevertheless, even after delayed and repeated replantation there is the possibility of a good long-term prognosis.

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## Figure legends

Figure 1. The extracted primary mandibular right second molar brought to the clinic by the patient. A deep indent, corresponding to the shape of the crown of the premolar was visible on the inner surface of the distal root.

Figure 2. Intraoral appearance of the extraction wound at the initial clinical examination showing previously replanted mandibular right second premolar covered with the soft tissue of the dental follicle extruding from the extraction socket.

Figure 3. Initial periapical radiograph showing the mandibular right second premolar with almost one-half of the root developed, rotated 90 degrees in relation to its long axis, with the buccal cusp oriented distally, and not replanted deep enough into its developmental crypt.

Figure 4. Intraoral appearance of the extraction wound after replantation of the mandibular right second premolar into its original position in the developmental crypt.

Figure 5. Post-operative periapical radiograph showing correct replantation of the mandibular right second premolar.

Figure 6. Normal and healthy clinical appearance of the mandibular right second premolar one year and ten months after replantation.

Figure 7. Periapical radiograph taken one year and ten months after replantation showing completed root development, closed apical foramen, slightly irregular root morphology and shorter root length, no signs of periapical pathosis and almost complete obliteration of the pulp chamber and root canal of the mandibular right second premolar.

Figure 8. Periapical radiograph taken two years and four months after replantation showing complete obliteration of the root canal of the mandibular right second premolar and no other differences compared to the previous radiograph.







