CASE REPORT

Treatment of a Dentigerous Cyst with Transposition of the Permanent Tooth Germ: A Case Report

Başak Kiziltan Eliaçık1, Naime Selen Özdemir2, Goksel Tımarcıoglu3

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ABSTRACT

Background: General factors such as endocrine disorders, osteopetrosis, Gorlin syndrome, and cleidocranial dysplasia or local factors such as supernumerary teeth, odontoma, cysts, tumors, dense mucoperiosteum, ankylosis, abnormal inclination and crowding, malposition of the tooth germ, dilacerations and trauma are the main causes of impacted teeth. In the case of a traumatic primary dentition, even a permanent tooth germ could be damaged. As shown in clinical results, malposition and disturbances of eruption, root deformation, and eruption disturbances could occur. According to dental literature generally accepted treatment options are surgical repositioning, extraction, and orthodontic traction.

Case description: A 10-year-old girl was referred by a pediatric dentist to the Health Science University of Istanbul with a pain complaint in the right lower quadrant. After a radiological examination, a cystic formation around the malposed permanent tooth germ and deep dentin caries in primary and permanent teeth in the lower right region were found. Surgical intrafollicular transposition was performed in order to correct the position of tooth 44’s germ and a full eruption to the correct position and root development were observed during the follow-up by the end of the first year.

Conclusion: Both early diagnosis and treatment are critically important for the prognosis of dislocated permanent tooth germ. Orthodontic traction could also be considered as a treatment option in hard cases instead of referring directly to extraction. Surgical repositioning of impacted permanent tooth germ could prevent malposition at later ages. Spontaneous eruption and function at occlusion are expected after surgical intervention.

Keywords: Permanent tooth germ, Surgery, Transposition.

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INTRODUCTION

Due to the close approximation of permanent tooth germ and primary tooth root, trauma to primary teeth leads to damages such as intrusion, avulsion, or displacement.1–3 Crown or root malformation, malposition in permanent dentition, enamel discoloration, tooth impaction, and migration of neighboring teeth are observed clinically. Orthodontic traction could also be considered as a treatment option in difficult cases instead of referring directly to extraction. Orthodontic traction is not considered appropriate in cases where the tooth is deeply impacted or the root is immature. Repositioning surgery is an alternative method of avoiding a later impaction problem or a malposition of the permanent tooth.1–6 After the surgery of the impacted germ, the tooth is expected to spontaneously erupt and maintain its function at occlusion.3,4,7,8

Case Description

A 10-year-old girl was referred by a pediatric dentist to the University of Health Sciences, Hamidiye Faculty of Dental Medicine with pain in the right lower quadrant. After a radiological examination, a cystic formation around the malposed permanent tooth germ and deep dentin caries in primary and permanent teeth in the lower right region were found. She had not received any prior dental treatment and was without a traumatic injury history. Teeth 55 and 53 were unrestorable and fairly mobile. Teeth 26, 36, 75, 74, and 46 had deep dentin caries; in addition, inactive caries were revealed in tooth 16. There was a presence of swelling around tooth 84 (Fig. 1). On radiological examination, there was a cystic formation around the malposed permanent tooth germ and deep dentin caries in primary and permanent teeth in the lower right region, as well as inflammatory resorption on teeth 63, 75, 84, and 85. Teeth 36 and 46 both required pulpal treatment because of the pain by percussion (Fig. 2).

Prior to applying general anesthesia, deep dentin caries of tooth 36 were treated with an indirect pulp capping of Mineral Trioxide Aggregate (MTA) and a fissure sealant for inactive caries on tooth 16. Regenerative endodontic treatment was done for tooth 46. Fissure sealant treatment was applied for each tooth as numbers 14, 15, 24, 25, 34, and 44, followed by fluoride application overall in order to prevent caries. The main goal of the treatment was to avoid the formation of a cyst around tooth 44 caused by the inflammation.
of tooth 84. For surgical repositioning, general anesthesia was required. It was decided that all extractions would be completed under general anesthesia (Fig. 3). A rectangular flap was raised with respect to the buccal aspect of the mandibular right premolar germ. The impacted germ was gently repositioned in accordance with its eruptive pathway with the beaks of the extraction forceps, after that a prudent removal of the surrounding bone was completed and sutured (Figs 4A and B). An incisional biopsy was executed by the cyst around the germ of tooth 44 (Fig. 4D). After the replacement of a sponge with furacin in the socket of tooth 74, the flap was returned to its original position (Fig. 4C). The sutures and the sponge with furacin were removed during the first post-operation control. The socket was irrigated with 0.9% isotonic sodium chloride and FIC (fractional inhibitory concentration). The sponge with furacin was put back and a second control in ten days was decided. The sponge was removed and the cystic area was irrigated with 0.9% isotonic sodium chloride.

Two months later, a radiographic control was held (Fig. 5). At regular controls, oral hygiene instruction was given to the patient; continued root development and spontaneous eruption were observed during the 16th month follow-up period. The repositioned premolar emerged from the buccal aspect in a higher position after 16-months and an increase in root length with dilaceration was confirmed by panoramic radiography. The tooth remained non-vital with negative results in cold pulp testing and the patient had no complaints such as pain, mobility, or swelling. Radiographic examinations revealed a continuous increase in dilacerated root length and root canal construction. After a clinical examination with percussion and a mobility test, there was a suspicion that tooth 44 might be ankylosed. Antibiotics and analgesics were not prescribed but a soft diet for three days after surgery was advised to avoid bites on the surgical area. The clinical and radiological follow-up of the patient is still proceeding.

**Discussion**

This case report shows that after surgical repositioning, spontaneous eruption of the impacted permanent germ and its root development both continue. Other treatment options for an impacted immature permanent tooth are orthodontic traction after surgical exposure and extraction of the impacted germ. Surgical exposure followed by orthodontic traction is a common treatment but is also limited in the case of a severe impaction due to the requirement of too many visits by the patient and the long period of time necessary for traction. The advantage of this treatment is the increased freedom of the tooth movement. Extraction of the impacted tooth germ is a radical option; hence, it causes several complications after the treatment but offers a quick solution.
Figs 4A to D: (A and B) The impacted germ was repositioned gently according to its eruptive pathway by the beaks of the extraction forceps; (C) After the replacement of a sponge with furacin to the socket of tooth 74, the flap was returned to its original position; (D) Incisionel biopsy was operated for the cyst around the germ of tooth 44

Figs 3A to E: Intraoral photographs after the completion of all treatments within 2 months of the surgical procedure
The early loss of the mandibular premolar tooth may result in an inclination by the adjacent teeth towards the extraction area and most critically, loss of alveolar height in the posterior region of the mandible, and malocclusion might also occur. The patient needs complicated orthodontic treatment, which takes a long time. While the premolar space can be compensated with a prosthesis in adults over the age of 18, it is not possible to apply a permanent prosthesis and implant in patients under the age of 18 because skeletal and dental maturation is not completed. Space maintainers or removable appliances are suitable for patients under 18.

9, 11 Agrait et al. proposed surgical repositioning due to advantages such as simplified treatment, normal gingival margin, and aesthetic improvement if the patient needs short-and-simple orthodontic therapy after a single surgical procedure and the adaptation of root development to its new position. 9 In this case, surgical repositioning was performed as in Agrait et al. and correct germ eruption was followed.

Studies in the early 80s conducted by Azaz and Andreasen report spontaneous tooth eruption and root formation. Periodontal ligament damage resulted in injury to the pulp, root resorption, ankylosis, pulpal necrosis, and Hertwig’s epithelial root sheath (HERS) damage. Pristine Hertwig’s epithelial root sheath and solid periodontal ligament are the main factors that ensure expected root growth. Agrait and Azaz state that surgical repositioning causes deformation in the Hertwig epithelial sheath, which may damage the dental follicle. Scientists have stated that root development may also be affected by surgical repositioning. When the surgical repositioning is operated on at an earlier stage, root development and inclination continue in a proper spatial relationship to the aligned crown. 9, 12–14 An operation at an earlier stage of root formation could provide the ability to mobilize the germaine tooth and prevent harm to root development. 11 In this case, a surgical repositioning was performed at the early stage of germ. After the 1st, 3rd, 6th, 12th, and 15th month follow-up, the process of root development was observed but a slight inclination was present. Crown alignment was normal.

Kim et al. reported that early surgical repositioning with a closed-flap technique could be contemplated as a distinct option to orthodontic traction and extraction for an ectopically impacted immature tooth in the initial root formation stage, when the root is not dilacerated, although surgical repositioning has a high risk of complications, such as pulp necrosis, root resorption, ankylosis and malformation of the adjacent teeth. 3, 7, 13 In this case after the 1st, 3rd and 6th month follow-ups the cold tests resulted negative. The 12th and 15th months showed positive responses. In the periapical radiography, there was no presence of lamina dura and physiological mobility. A blunt voice was heard during the percussion; therefore, ankylosis presence was considered. Adjacent teeth were free of malformation and root resorption.

Stem cells from the apical papilla (SCAP) are possible sources of odontoblasts for root dentin, so the odontoblast has a critical role in root formation for immature teeth.

Huang et al. introduced a non-traumatic attitude to preserving HERS intact; periodontal ligaments and SCAP were crucial for the success of the surgical repositioning pending the operation. 1, 2, 13, 15, 16 In this case, an incisional biopsy was performed along with the surgical repositioning. Biopsy observation demonstrated the slight presence of spiculated bone calcification around collagen fiber tissue and the absence of a cystic lesion. HERS and SCAP information are not available due to a lack of histological examination.

Andreasen et al. reported that the stage of root formation (open apex or closed apex), extraoral time, storage type (wet or
dry), and infection control were the main factors for the prognosis of the surgical repositioning. Irreversible cell damage of periodontal ligament (PDL) stem cell pulp occurred in a long extraoral time and dry storage. The vitality of the repositioned tooth with an open apex was retained 76–94% but only 22% in teeth with a matured apex. In this case tooth extraction was not performed and the impacted germ was gently repositioned in accordance with its eruptive pathway with the beaks of the extraction forceps, after that a prudent removal of the surrounding bone was completed and sutured. Since extraction was not performed and the tooth had safe storage, preservation of the periodontal ligament along with vitality is expected.

As also in the case of Agrait et al., this practice demonstrated after a single, short, and simple surgical repositioning session, the cure is completed with the expectation of spontaneous tooth eruption and marginal gingiva to become both normal. After a follow-up of the 1st year, it is observed that the marginal gingiva is almost entirely cured and the occlusion level is well-matched to the physiological eruption. This case thus resulted in contrary to the thesis of Azaz et al., which foresees a risk of pulp necrosis; the vitality is conserved as shown by a following cold test. In this case, ankylosis is observed due to periodontal ligament damage as also reported in the studies of Huang and Azaz et al. Since the root formation is abnormal, it might be considered Hertwig’s epithelial root sheath is damaged as reported by Azaz et al., but since no histological study is processed in this case, clear information about SCAP and HERS will not be provided.

**Conclusion**

The development of the permanent tooth germ is affected by dental trauma on a primary tooth. Clinicians must be aware of the fact that an early diagnosis can intercept more complicated therapies afterward. This case demonstrates that an impacted permanent tooth germ maturation proceeds despite the inflammation and a cystic formation after surgical repositioning. This treatment method is an effective alternative to the traditional methods of extraction and/or orthodontic traction after surgical exposure. The pros of surgical repositioning are aesthetical improvement during the maturation of dentition, a simpler operation (one single visit), viable gingival margin, decent occlusion after the maturation is completed, and the adaptation of the root’s maturation to its new position. The repositioned tooth’s pulp affects the surgical process. Ankylosis despite the root formation continues because of the fact that the opening flap technique may damage the PDL, HERS, or SCAP.

**Statement of Ethics**

Participant and the parents gave written informed consent and the study followed the tenets of the Declaration of Helsinki.

**Orcid**

Başak Kiziltan Eliaçik [https://orcid.org/0000-0003-1848-3007](https://orcid.org/0000-0003-1848-3007)

Naime Selen Özdemir [https://orcid.org/0000-0002-9346-9769](https://orcid.org/0000-0002-9346-9769)

Goksel Timarcioğlu [https://orcid.org/0000-0003-2464-2940](https://orcid.org/0000-0003-2464-2940)

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