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Management of impacted premolar with root dilaceration caused by radicular cyst in deciduous molar: A case report

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Author Contributions

Shuhao Xu performed the orthodontic treatment in this case and wrote the manuscript.

Yu Zhang and Wei Li performed the operation related to operative dentistry in this case. Xiaolong Li refined the manuscript.

Consent

The child's parents gave written informed consent for publication of medical information and images.

Conflicts of interest

The authors declare that they have no conflicts of interest.

Ethical approval

Consent was obtained from the child's parents regarding the publication of the case and images. This report does not contain any personal information that could lead to the identification of the patient.

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Data availability statement Date and materials are presented in the manuscript.

Abbreviations

CBCT Cone beam computed tomography

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Key Clinical Message

Radicular cysts in deciduous teeth can lead to root dilaceration in inherited permanent teeth, resulting in impacted permanent teeth. In this case, the root should leave the cortical bone and enter the cancellous bone through early orthodontic traction to obtain growth space, thereby increasing the root length and reducing the crown-root angle. Even in cases of curved teeth with short roots or bone fenestration following traction, the long-term postoperative effect of traction treatment may be ideal.

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Abstract Radicular cysts in deciduous teeth can lead to root dilaceration in inherited permanent teeth, resulting in impacted permanent teeth. Early orthodontic traction should be performed to move the root from the bone cortex into the cancellous bone to obtain growth space. We presented an 11-year-old boy who underwent decompression and drainage of a radicular cyst in deciduous teeth, followed by early orthodontic traction of inherited permanent teeth with root dilaceration. After treatment, the radicular cyst in deciduous teeth healed, the orthodontic traction of inherited permanent teeth was in place, and favorable treatment outcomes were achieved.

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Keywords Radicular cysts, root dilaceration, impacted teeth, orthodontic traction

1. Introduction

Radicular cysts in deciduous teeth are commonly caused by dental pulp necrosis due to caries or trauma, which may affect the development and normal eruption of inherited permanent teeth[1]. In severe cases, it can cause root dilaceration of inherited permanent teeth, leading to impaction of those teeth[2]. In cases of radicular cysts in deciduous teeth, permanent tooth germs should be preserved whenever possible. Extraction of the affected deciduous teeth often allows smaller radicular cysts to resolve spontaneously. However, large radicular cysts can be decompressed and drained to protect the permanent tooth germs[3,4]. For impacted permanent teeth or root dilaceration, orthodontic traction is carried out at the early stage to induce normal eruption of permanent teeth and maintain the integrity of the dentition[5]. In this case report, we presented an 11-year-old boy who underwent decompression and drainage of a radicular cyst in deciduous teeth, followed by early orthodontic traction of inherited permanent teeth with root dilaceration. After treatment, the radicular cyst in deciduous teeth healed, the orthodontic traction of inherited permanent teeth was in place, and favorable treatment outcomes were achieved.

2. Case History/Examination

An 11-year-old boy went to our outpatient clinic with a complaint of "swelling and pain in the gums of the left lower posterior teeth for one week". He was healthy, with normal general development, and denied a history of systemic diseases, family diseases, and drug allergies. The left lower deciduous teeth had a history of filling treatment.

Maxillofacial examination: The bilateral maxillofacial regions are symmetrical, without obvious maxillofacial swelling. No swollen lymph nodes were palpated in the left submandibular region, and mandibular function movement was not limited.

Intraoral examination (Figure 1): He presented with mixed dentition. Tooth 74 has not been replaced, and the remaining deciduous teeth have been replaced. Fillings were observed on the distal and middle adjacent surface of tooth 74, with painful knocking (+) and loose (I°), and the gingiva in the buccal apical area was swollen and tough.

Auxiliary examination (Figure 2): Cone beam computed tomography (CBCT) showed 74 apical areas with an oval transmission of about 11 mm × 7 mm. The germ of the permanent tooth 34 was inclined in the buccal direction, impacted horizontally, and the root was curved. The roots developed to the Nolla stage 8.

3.Methods

Diagnosis: (1) radicular cyst of 74, (2) impacted 34 with root dilaceration.

Treatment plan: (1) Decompression and drainage of the radicular cyst in 74, (2) Orthodontic traction of 34, (3) In the later stage, the need for stage II comprehensive orthodontic treatment should be evaluated according to the requirements and the occlusion of the child.

Local infiltration anesthesia was performed, and the tooth was pulled out following satisfactory anesthesia. The cyst wall was explored through the tooth extraction wound, and purulent exudation was observed after puncturing the cyst wall. A drainage strip was placed after repeated flushing with normal saline until the flushing solution became clear. At the same time, to prevent the drainage strip from falling off and being swallowed or aspirated by the child, the drainage strip was sutured (Figure 3).

After one week, the drainage strip was removed and washed continuously. No purulent exudation was observed. At this time, crown of 34 was visible from the extraction wound of 74 (Figure 4).

After 2 months of follow-up, 74 tooth extraction wounds healed well, with 34 crown visible, and 34 crown swelled palpably in the buccal gingiva (Figure 5).

Two months after the operation, the panoramic radiograph showed that the transmission shadow of the apical area disappeared bone mineral density increased, and the buccal-lingual impacted image in 34 (Figure 6).

His parents were informed that the radicular cyst in deciduous teeth was healing well, and a plan was made to perform orthodontic traction of 34. His parents provided informed consent for the follow-up treatment plan and signed the consent form.

A mandibular lingual arch was made and bonded to strengthen anchorage, maintain the mandibular arch, and support the bonding of a local fixed orthodontic appliance; After the contraindication was eliminated, fenestration was performed on 34. The crown of 34 was exposed, and local compression was applied to effectively control the bleeding (Figure 7).

One week after exposure, and following wound healing, the bracket of 34 was bonded and drawn with 0.012 hyperelastic NITI wire (Figure 8).

Two months after exposure, the bracket of 34 was gradually aligned into the dental arch and was replaced with 0.018 NITI wire to continue to align the teeth (Figure 9).

4.Results

Six months after exposure, the bracket of 34 was aligned into the dental arch (Figure 10), and 34 had normal pulp vitality, without abnormal looseness. His parents were satisfied with the treatment outcome at this stage. Due to the academic reasons of their child, they did not consider stage II orthodontic comprehensive treatment for the time being, and requested the removal of the fixed appliance from the lower half of the mouth, thereby ending treatment at this stage and transitioning to the passive maintenance stage. A panoramic radiograph was taken before removing the fixed appliance, and it showed that the 34 had curved roots, without obvious abnormality in the bone mineral density at the apical area (Figure 11).

5. Discussion

The radicular cyst in deciduous teeth is classified as an inflammatory odontogenic cyst, typically resulting from dental pulp necrosis caused by caries, trauma, abnormal tooth development, and other factors[1]. It can also arise from the use of materials containing cresol in dental pulp treatment [6].

Radicular cysts in deciduous teeth can cause local pain and swelling, as well as apical bone destruction. In severe cases, it may lead to extensive bone destruction and affect the inherited permanent tooth germ, resulting in impaction of the inherited permanent teeth. Small radicular cysts in deciduous teeth often resolve spontaneously after extraction of the affected deciduous teeth. For extensive radicular cysts in deciduous teeth, permanent tooth germs should be preserved as much as possible, because children have a strong bone regeneration ability and can repair bone defects quickly after operation[3]. Therefore, for a large range of radicular cysts in deciduous teeth, relatively conservative treatment schemes, such as bagging or decompression and drainage, should be considered to protect the permanent tooth germs under deciduous teeth as much as possible[4].

Root dilaceration refers to abnormal tooth development in which the crown or root deviates from the long axis of the tooth, often resulting in a certain bending angle between the crown and root (or part of the root), and this condition is considered an abnormality in tooth morphology. Root dilaceration usually fails to erupt smoothly, resulting in impaction. Impacted teeth with root dilaceration are usually caused by acute mechanical injury [7] or developmental interference factors, including apical periodontitis of deciduous teeth, cleft lip, and palate, ectopic tooth germ development, soft tissue scarring, insufficient space, or interference from surrounding structures, dental tumor, dental follicles, adhesion of the deciduous teeth root, genetic factors, and some syndromes[8]. This case demonstrates root dilaceration and impaction of the inherited permanent teeth caused by a radicular cyst in the deciduous teeth. It highlights the importance of maintaining the health of deciduous teeth for the proper development and eruption of permanent teeth. The prevention and treatment of children's dental diseases still needs continued efforts. For impacted teeth without root dilaceration, early orthodontic traction can reduce the risk of developing root dilaceration. For the affected teeth with root dilaceration, early orthodontic traction can use the development potential of the epithelial root sheath to produce a secondary curvature, thereby promoting continued root development. It increases the root length and reduces the crown-root angle[9-11]. At the same time, orthodontic traction can prevent alveolar bone atrophy and adjacent tooth inclination after missing teeth. Even if the tooth becomes loose over time due to excessive chewing forces, it preserves sufficient alveolar bone mass for adult implant restoration.

Therefore, early detection, diagnosis, and traction are needed for impacted teeth with root dilaceration. Moreover, even for root dilaceration with short roots or bone fenestration after traction, as long as there is no significant abnormality in pulp vitality or abnormal looseness, the long-term postoperative effect of traction treatment is ideal. This may be attributed to the favorable physical chimerism between the curved roots and the alveolar bone, allowing the crown to withstand normal bite force [12, 13].

6. Conclusion

Radicular cyst in deciduous teeth can cause local pain swelling and apical bone destruction. In severe cases, they may cause extensive bone destruction and affect the inherited permanent tooth germ, resulting in the impaction of inherited permanent teeth. Therefore, early detection, diagnosis, and intervention should be carried out for radicular cysts in deciduous teeth. Small radicular cysts in deciduous teeth often resolve spontaneously after the extraction of the affected deciduous teeth. For a large range of radicular cysts in deciduous teeth, relatively conservative treatment schemes, such as bagging or decompression with drainage, should be considered to preserve the permanent tooth germs under the deciduous teeth as much as possible.

For inherited permanent tooth impaction or even root dilaceration, early orthodontic traction should be performed to move the root from the bone cortex into the cancellous bone to obtain growth space. This process can increase the root length and reduce the crown-root angle. Even for curved teeth with short roots or bone fenestration after traction, the long-term postoperative effect of traction treatment may be ideal. At the same time, orthodontic traction can avoid alveolar bone atrophy and adjacent teeth inclination following teeth loss. Even if the tooth becomes loose over time due to unbearable chewing force, it preserves sufficient alveolar bone mass for adult implant restoration.

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Figure Legends

Figure 1 (A-B) Pretreatment Intraoral photographs.

Figure 2 (A-E) Pretreatment CBCT examination.

Figure 3 Intraoral photograph: Pulling out 74, flushing the capsule cavity, and reaching the drainage strip.

Figure 4 Intraoral photographs: one week after the operation.

Figure 5 (A-E) Intraoral photographs: follow-up two months after the operation.

Figure 6 Panoramic radiograph: two months after operation.

Figure 7 (A-B) Intraoral photographs: at the beginning of exposing and orthodontic traction 34.

Figure 8 (A-C) Intraoral photographs: one week after exposure.

Figure 9 (A-B) Intraoral photographs two months after exposing 34.

Figure 10 (A-D) Intraoral photographs: six months after exposure.

Figure 11 Panoramic radiograph was reexamined six months after exposure.

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