

MANAGEMENT OF A PERIAPICAL CYST IN AN 8-YEAR OLD PATIENT WITH CHALLENGING ETIOLOGY: A CASE REPORT WITH THREE YEAR FOLLOW UP

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Abstract: The success of pulp therapy in primary teeth depends on accurate diagnosis and effective treatment. Periapical inflammation due to bacterial infection or pulpal necrosis can result in granulation tissue and may activate epithelial rests of Malassez, leading to a periapical cyst. In large cysts, especially in children, marsupialization is preferred to preserve developing teeth and minimize damage to surrounding structures. This case report describes an 8-year-old presenting with spontaneous pain in the lower right jaw. Radiographic examination revealed a round well-defined radiolucency over 1 cm around tooth #84 with root canal treatment and #85 with pulpotomy, with dental bud displacement. The preliminary diagnosis was in favor of a periapical cyst due to pulp therapy failure. Teeth #84 and #85 were extracted, and marsupialization was performed. Over three years, the cyst resolved completely, and teeth #44 and #45 erupted naturally in proper alignment.

Keywords: Marsupialization, Periapical disease, Jaw cysts, Primary dentition, Pulpotomy

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Conflicts of interest:

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PRISE EN CHARGE D'UN KYSTE PÉRIAPICAL CHEZ UN PATIENT DE 8 ANS AVEC UNE ÉTIOLOGIE COMPLEXE: UN CAS CLINIQUE AVEC UN SUIVI DE TROIS ANS

Résumé: La thérapeutique pulpaire en denture temporaire repose sur un diagnostic correct et un traitement adéquat. Une infection bactérienne ou une nécrose pulpaire peuvent entraîner une inflammation périapicale, la formation de tissu de granulation et l'activation des restes épithéliaux de Malassez, pouvant évoluer en kyste périapical. Chez l'enfant, les kystes volumineux sont traités préférentiellement par marsupialisation pour préserver les germes dentaires et protéger les structures adjacentes. Ce cas concerne une patiente de 8 ans présentant une douleur spontanée à la mandibule droite. L'examen radiologique révèle une radioclarité arrondie, définie, de plus de 1 cm en regard des dents #84 (traitée endodontiquement) et #85 (traitée par pulpotomie), avec déviation des germes #44 et #45. Le diagnostic préliminaire était un kyste périapical suite à l'échec des traitements pulpaire. Les dents atteintes ont été extraites et une marsupialisation réalisée. Trois ans plus tard, le kyste a régressé et les dents permanentes ont fait éruption.

Mots-clés: Marsupialisation, Maladies périapicales, Kystes des mâchoires, Dentition temporaire, Pulpotomie.

Introduction

Primary teeth play an essential role in the harmonious development of the jaws, arch perimeter, facial harmony and psychosocial development of the child [1, 2]. Due to their particular anatomy, they are very prone to cavitation and infection.

Pulp therapy in children is difficult due to the particularities of pulpal physiology encountered in primary teeth and to the poor cooperation of children [4, 5]. The correct diagnosis is crucial for the long-term success of any pulp therapy [3, 6]. In case of irreversibly infected or necrotic pulp, pulpectomy is indicated to avoid premature extractions [7, 8]. Despite an adequate mechanical and chemomechanical preparation, root canal treatment of primary teeth is challenging due to the continuously changing anatomy, abundance of lateral and accessory canals, and apical isthmuses. [6, 9, 10].

The prognosis and success of pulp therapy in primary teeth is based on both clinical and radiographic criteria. According to Waterhouse & Whitworth, regardless of the clinical signs, pulp-treated teeth which presented signs of pathologic resorption or bone rarefaction in follow-up radiographs are classified as failures [11].

A periapical inflammation can occur due to a bacterial infection and/or pulpal necrosis of non-vital teeth, forming a granulation tissue that causes an increased osmotic pressure, that can lead to the activation and proliferation of the epithelial rest of Malassezia (ERM) located around the apex of the affected tooth [12, 13]. Nevertheless, the ERM is generally not activated, and only granulation tissue develops at the apex of the affected tooth, called a periapical granuloma that lacks an epithelial lining. However, it can be the precursor of a periapical cyst, which is an epithelial-lined cavity and the most common odontogenic cyst developing at the root apex of a non-vital tooth due to inflammation [13].

When a cyst is detected, early management and referral to oral surgery is necessary to minimize the extent of jaw bone destruction [14]. According to the cyst size and location, the removal of unerupted teeth, and follow-up possibilities, odontogenic cysts are managed either with enucleation or with marsupialization, which is the conversion of a cyst into a pouch by suturing the cyst lining to the oral mucosa [14, 15].

Marsupialization is usually preferred in case of large dentigerous cysts, when the preservation of the displaced teeth is indicated, especially in young patients, and when there is a possibility of destruction of the surrounding tissue and a pathologic fracture of the mandible [15, 16].

In a pediatric patient presenting with a large periapical radiolucency, what could be the diagnosis and what is the most effective treatment alternative in preserving the underlying permanent tooth and supporting bone healing?

The following case-report presents a case of a periapical cyst in an 8-year-old patient with challenging etiology. It is notable for

and proper eruption of permanent teeth, emphasizing the importance of careful treatment planning and patient compliance in achieving optimal results.

Case presentation

An informed consent for publication was obtained from the parents.

Initial examination

The patient Y.A.T, 8 years old, came to the center of care of the Faculty of Dental Medicine at the Saint Joseph University, Beirut, Lebanon, for spontaneous pain in the lower right side on April 2019. The panoramic X-Ray showed big cavities on teeth #84 and #85, lower second right primary molars, with a radiolucency on tooth #84 (Figure 1). The patient underwent pulpotomy, fixed with formocresol and the cavity obturated with zinc oxide eugenol, followed by a stainless steel crown on tooth #85 and pulpectomy with the root canals obturated with zinc oxide eugenol, followed by a stainless steel crown on tooth #84.



Figure 1. Panoramic X-Ray on April 2019

its unclear etiology, likely linked to failed pulp treatments in adjacent primary molars, and the successful use of marsupialization as a conservative approach in a young patient. The case also demonstrates favorable long-term outcomes, including complete bone healing

On April 2021, the patient came back with pain and oedema on the lower right side. A lower right periapical radiograph was taken and showed interradicular lesions on teeth #84 and #85 (Figure 2). She was prescribed antibiotics per os (Augmentin (457 mg/5mL), twice



Figure 2. Lower right periapical radiograph on April 2021

per day, for 7 days after meals. A panoramic X-Ray was taken to elaborate a complete treatment plan. It revealed a single unilocular radiolucent lesion with clear borders, below teeth #84 and #85 that were treated, with a deviation of dental buds (Figure 3).

Differential diagnosis

When encountering radiolucency, various differential diagnoses should be considered to accurately determine the underlying pathology. The radiolucency seen was a single unilocular radiolucent lesion with clear borders. The differential diagnosis is presented in Table 1:

Diagnosis

The radiolucency was seen in the mandible, around the roots of non-vital teeth, with a round/oval shape and well-defined borders, larger than 1cm and without pus. The preliminary diagnosis was a periapical cyst related to the failure of endodontic treatment of the primary teeth on which different pulp therapies were performed: tooth #84 with root canal therapy and tooth #85 with pulpotomy. The etiology of the cyst remains undetermined : The post op radiographs of tooth #84 show that the mesial canals seem empty, indicating a failed pulpectomy. The cyst could also be related to the failure of pulpotomy on tooth #85 either due to an incorrect diagnosis



Figure 3. Panoramic X-Ray on April 2021

Table 1. Differential diagnosis for the single unilocular radiolucent lesion with clear borders [17, 18, 19]

Lesion	Distinguishing Features	Key Differences
Periapical Granuloma	Often indistinguishable radiographically	Smaller (<1 cm)
Periapical Abscess	Painful, may show soft tissue swelling and pus drainage	Acute or chronic inflammation; rapid onset; often symptomatic
Dentigerous Cyst	Associated with crown of unerupted tooth	Pericoronal, not periapical; often affects third molars/canines
Residual Cyst	Remains after extraction of causative tooth.	Similar in appearance but no associated tooth
Lateral Periodontal Cyst	Found between vital teeth, usually mandibular premolars.	Vital adjacent teeth; lateral root surface
Stafne Bone Defect	Below mandibular canal; well-defined; no symptoms	Posterior mandible
Periapical Cyst	Associated with non-vital tooth; round/oval, well-defined border	Apex of non-vital tooth

or to the medicament placed in the pulp chamber.

Thus, the etiology of the cyst is unclear as it can be related to both primary molars.

Treatment objectives

The treatment objective was to heal the cyst and therefore for the premolars #44 and #45 to make

their eruption in the right place, in a quasi-orthogonal window, to reduce the risk of a malocclusion and radicular edification. The communication between the cyst and the oral cavity must stay open to reduce intraluminal pressure and to promote bone formation. The centripetal healing of the bone allows for a faster reduction of the cystic cavity volume [20].

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Treatment alternatives

Different approaches can be adopted when treating a periapical cyst. Periapical cysts are either treated with an adequate root canal therapy, an apicoectomy or extraction of the teeth linked to the cyst, followed by marsupialization or enucleation. However, to avoid any residual cyst, extraction with curettage of the socket remains the most effective technique [13]. There remains no clear consensus whether enucleation or marsupialization represents the optimal treatment approach for cystic lesions. However, enucleation could cause neurosensory impairment or potential bone pathological destruction of the mandible or surrounding tissues. Marsupialization is recommended for large cysts to minimize morbidity, prevent damage to vital structures such as those near the mandibular canal, antrum, and permanent tooth buds, reduce significant bone loss, avoid growth disturbances, and prevent pathologic fractures [21].

The patient was young, the cyst considered large, and the preservation of the displaced teeth was indicated. Therefore, it was decided to treat this cyst with marsupialization.

Treatment progress

The patient was referred to the oral surgery department. On the day of the intervention, the patient was very cooperative, since she had already been treated for other teeth. Posterior alveolar nerve block supplemented by a periapical anesthesia for the long buccal nerve anesthesia using 4% Articaine with 1:100 000 Epinephrine (Septodont, France) was first performed. Syndesmotomy was then done followed by extraction of teeth 84 and 85 using pediatric forceps for lower deciduous molars (Figure 4) and clean dental sockets with direct access were obtained (Figure 5). Curettage was avoided in order to preserve the tooth bud below.



Figure 4. Extraction of teeth #84 and #85



Figure 5. Clean dental sockets and direct access

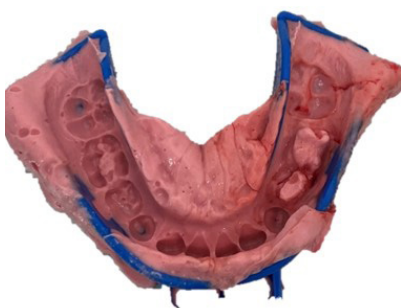


Figure 6. Alginate impression

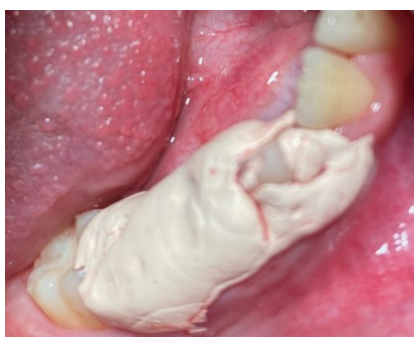


Figure 7. Periodontal dressing (copack) temporarily on the extraction site

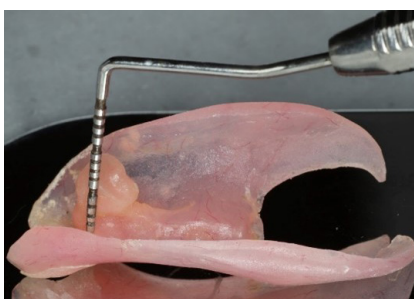


Figure 8. Custom obturator

Insuring that the cyst is open is essential to decrease intraluminal pressure and initiate bone formation, which is achieved by using obturators [22]. Ideally, the obturator must have been prepared prior to the extraction in order to place it immediately. However, due to the urgency of the case, extraction was first performed, followed by an alginate impression (Figure 6). In order to keep the alveoli open and the communication between the cystic cavity and the oral mucosa until the obturator was delivered by the lab, periodontal dressing (copack) was used for the first coming days (Figure 7). The patient was advised to keep the dressing in place without removing it. Postoperative recommendations stressed on the importance of avoiding any heat, effort or gargling during the first 24h, maintaining a soft diet during the first week, gargling with warm saline water 3 times a day after meals starting 24h after the extraction and taking penicillin antibiotics 50mg/kg/j for 7 days along with paracetamol when needed for pain relief.

The obturator (Figure 8) was delivered 3 days after the extraction and the periodontal dressing was removed. The obturator was customized in-office using pink resin in order to accommodate it to the alveoli's aspect and make it reach the permanent tooth bud without performing any active pressure on it. It could prevent cystic cavity closure and play the role of a space maintainer. The patient and their parents were instructed to rinse the extraction site three times daily after each meal with warm saline water and chlorhexidine 0.12%, and to clean the obturator very carefully and to put it back in place [23]. They were also informed that the patient would need to visit the oral surgery department on a regular basis for follow-up sessions in order to monitor the permanent teeth's eruption and shorten the obturator's level accordingly until the teeth hopefully emerge into the

oral cavity. Once the permanent teeth peeked into the oral mucosa, the obturator was removed, which was 1 year and a half later. Tooth 75 needed to be extracted later which made it essential to place a bilateral space maintainer until the full eruption of permanent teeth (Figure 9).



Figure 9. Lingual arch to maintain the space

Follow-up

In the recall session, in January 2022, a panoramic X-Ray was taken to assess the healing, after obtaining the consent from the legal guardians on Xray radiation. When compared to the panoramic X-Ray of April 2021, it was clear that the eruption paths of germs #44 and #45 was corrected (Figure 10). In November 2024, the patient was recalled. The cyst had completely healed (Figure 11) and the premolars made their eruption in the right place (Figure 12).

Discussion

Cases of periapical cysts have been frequently reported in the literature. They are epithelial-lined cavities and the most common odontogenic cysts of the jaws, developing at the root apex of non-vital teeth due to endodontic failure [13, 24]. The epithelial growth in the precursor inflamed periapical granuloma could rise the osmotic pressure, leading to a cyst formation and expansion. Radiographically, they appear with well demarcated uniform unilocular radiolucencies, and are associated with the apex of the tooth. Histologically, they are lined by a thin nonkeratinized



Figure 10. Panoramic X-Ray on January 2022



Figure 11. Panoramic X-Ray in November 2024



Figure 12. Lower arch with a complete eruption of permanent teeth

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stratified squamous epithelium surrounded by an inflamed connective tissue wall [24].

As far as treatment is concerned, most periapical cysts are treated with an appropriate root canal therapy, apicoectomy or extraction followed by marsupialization or enucleation. Extraction with curettage of the socket remains the most effective to avoid any residual cyst [13, 24]. Following treatment, they generally have a good prognosis, depending on the teeth affected, the size of the cyst, and the bone involvement [13].

There is no consensus on whether enucleation or marsupialization is the best approach for treating cysts. This is mainly because larger cystic cavities often lack proper blood clot organization, making the formation of new bone uncertain [15]. Yet, according to experts, bone grafting in young patients should be approached with caution and is usually unnecessary in most cases [20]. Young patients have higher bone regeneration capacity compared to adults and developing teeth with open apices have a remarkable eruptive potential [25]. Marsupialization offers a conservative alternative to enucleation, particularly suitable for young patients due to its lower risk of damage to adjacent anatomical structures, such as nerves and developing permanent teeth [15, 16]. While enucleation ensures complete removal of the cystic lining and may reduce recurrence risk, it is more invasive and can compromise bone integrity, especially in pediatric patients with growing jaws. In contrast, marsupialization facilitates gradual bone regeneration and allows for preservation of unerupted teeth, making it preferable in cases with limited bone destruction and compliant patients, as seen in the present case [14, 15, 16].

In the presented case, the cyst was seen around the roots of deciduous teeth #84 with root canal therapy and #85 with pulpotomy, with

neither extensive bone involvement of the mandible, nor complex cystic lesions. The preservation of the displaced teeth #44 and #45 was desirable and a quasi-orthogonal window could drive the developing permanent dentition toward a correct eruption, reducing a malocclusion risk; an outcome which was achieved after 3 years (Figures 10 and 11). The centripetal healing of the bone allows for a faster reduction of the cystic cavity volume following marsupialization [20]. Moreover, the patient was young and marsupialization was a safer choice to avoid any possible neurosensory impairment or pathological destruction of the mandible or surrounding tissues that could be possible consequences of enucleation [15, 16]. A CBCT scan was not performed, since there was a direct access to the alveoli after extraction for marsupialization and there was neither an extensive bone involvement nor complex cystic lesions [16].

A correct pulpal diagnosis in children is very difficult. The threshold and objective response to pain might sometimes not be accurate [26]. In this case, different pulp therapies were performed: pulpectomy on tooth #84 and pulpotomy on tooth #85. Pulpectomy is the treatment of choice for primary teeth with irreversibly infected or necrotic pulp [27]. It consists of mechanical root canal debridement, chemical irrigation and a tridimensional obturation with a resorbable paste with antibacterial properties, through the complex root canal system [2, 8]. However, on post op radiographs of tooth #84, the mesial canals appear empty, indicating a failed pulpectomy. The tooth #85 was treated with a pulpotomy. Pulpotomy of a primary tooth is a standard and successful procedure in children, when radicular pulp is not infected and is not irreversibly inflamed and the tooth is asymptomatic or shows reversible

pain, with no radiographic signs of infection or pathologic resorption [28]. However, it can also sometimes fail. Abscess or cyst formation in the periradicular area of pulpotomized teeth was reported in several studies [28]. Failure can be related to an incorrect diagnosis or the medicament placed inside the pulp chamber. Formocresol, which is a fixating agent used during primary teeth pulpotomy, still recommended by the American Academy of Pediatric Dentistry, can lead to several side effects that include displacement of the permanent tooth, amelogenesis imperfecta, and cyst formation. The latter is often linked to changes in the reduced enamel epithelium, which can lead to fluid accumulation between the epithelium and the tooth crown [29, 30]. Therefore, the etiology of the cyst in this case is unclear. It can be related to both primary molars. The management of the cyst is however the same, regardless of the etiology.

Marsupialization relies on the decompression phenomena, insured by a reduction in IL-1 α (interleukin-1alpha) and other inflammatory cytokines production in order to permit bone formation. Once exposed to the oral cavity, oral normal epithelium replaces the cystic mucosa [31]. However, the risk of marsupialization is the pathologic tissue left in situ [15]. Discussing clinical and radiographic findings with patients and offering treatment options is essential. In the present case, because follow-up visits were scheduled with the patient at the beginning and the patient was motivated to maintain a good oral hygiene and follow the post-operative recommendations at home, marsupialization could be adopted [15].

It is interesting to note in this case the limitation of periapical radiographs. When the patient presented to the clinic for pain in the lower right region, (Figure 2) a periapical radiograph was taken. It showed interradiacal lesions that lead to misdiagnose the

presence of a cyst, and only an OPG panoramic revealed the presence of a periapical cyst. A study conducted by Endres et al. showed that the differences in dental professionals' skills in interpreting radiographs can lead to potential misdiagnosis or inappropriate treatment [32]. Having the right radiographic taken from the start could reduce the overall risk of misdiagnosis and poor management. A CBCT scan would have given more precise information about the extent of the lesion, and the bone involvement. However, since marsupialization was decided, it was not deemed necessary to take a CBCT scan in this case [16].

The limitations of this case report rely in the absence of the CBCT scan and an anatomopathological analysis that were not performed as part of this evaluation. But, in cases of

extensive bone involvement and the presence of complex cystic lesions, advanced imaging is necessary [16]. Histopathologic tests prevent misdiagnosis. However, it has been argued that a thorough and methodical clinical evaluation and diagnosis can reliably distinguish endodontic from non-endodontic pathology. As a result, routinely submitting endodontic surgical specimens for anatomopathology does not offer a clear benefit to the patient in such cases. From this viewpoint, histologic submission should be guided by clinical suspicion. The decision to forgo these examinations in this case was based on clinical judgment and lack of indication [33]. Finally, ideally, the decompression obturator prostheses in the treatment of odontogenic cysts should have been manufactured

prior to the extraction to keep the alveoli open [34, 35]. However, due to the urgency of the case, extraction was first performed, and this delay was managed with a copack to keep a communication between the cystic cavity and the oral mucosa until the obturator was delivered by the lab.

Conclusion

This case highlights the clinical value of marsupialization as an effective, conservative treatment option for periapical cysts in pediatric patients, demonstrating complete healing and proper eruption of the permanent teeth. It also underscores the importance of individualized treatment planning based on anatomical proximity, cyst size, patient age, compliance, oral hygiene, and the feasibility of long-term follow-up of each case.

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