Treatment of Large Jaw Bone Cysts in Children

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ABSTRACT

Odontogenic cysts are classified into 2 main types based on their formation mechanism: inflammatory and developmental. Radicular cysts are the most common inflammatory cysts, while dentigerous cysts are developmental cysts. We report 2 radicular cysts that developed at the apices of nonvital primary teeth and 2 dentigerous cysts. All 4 patients were young girls who experienced swelling in the mandibular molar region. Panoramic radiographs revealed a large cyst under the primary second molar, displacing the permanent second premolar or first molar to near the mandible's lower border. The treatment plan was begun with conservative decompression. Patients were followed up for several years. The process is described.
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KEYWORDS: RADICULAR CYST, DENTIGEROUS CYST, DECOMPRESSION

Radicular cysts are the most common type of cystic lesion occurring in the jaw, and account for 78 per cent of all jaw cysts[1]; however, they are considered to be rare in the primary dentition,[2] comprising only approximately 1 percent to 3 percent of the total number of radicular cysts in both the primary and permanent dentition.[2,3] Radicular cysts in the primary dentition are located around the roots and originate from epithelial remnants of the periodontal ligament as a result of inflammation that is generally a consequence of pulp necrosis. Most radicular cysts seen in the primary dentition are associated with mandibular molars.[4] Although they may also be a result of traumatic injuries to the primary teeth,[2,5] caries is the most frequent etiological factor of radicular cysts in the primary dentition.[4]

Dentigerous cysts account for approximately 2 percent of all jaw cysts. A dentigerous cyst is one that encloses the crown of an unerupted tooth and is attached to the tooth's neck by expansion of its follicle.[2] It is caused by an alteration of the reduced enamel epithelium, which results in fluid accumulation between the epithelium and tooth crown.[2,6,7] Azaz and Shteyer[8] suggested that persistent and prolonged inflammation from a nonvital primary tooth may cause chronic irritation to the dental sac of an unerupted succedaneous permanent tooth, thus stimulating dentigerous cyst formation.

The specific clinical features of radicular and dentigerous cysts are the large size, rapid growth, buccal expansion, and displacement of succedaneous teeth.[9,10] This reports 4 cases of large cysts associated with primary molars. This study was to report on the treatment of the large cysts that developed in conjunction with nonvital primary molars and to discuss the treatment effects.

CASE 1

A 6-year-old healthy girl was referred to the Pedodontic Clinic of China Medical University Hospital, Taichung, Taiwan, for inspection of a painful swelling in the primary mandibular left molar region. She had received several pulp treatments of the primary molars in local dental clinics. A clinical examination revealed marked

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buccal bony expansion and facial asymmetry. A panoramic radiograph showed a unilocular radiolucent lesion, 2 x 2 cm in diameter, under the primary mandibular left second molars, displacing the succedaneous permanent second premolar to the mandible's lower border (Figure 1a). There was a foreign body-like pulpal medicament inclusion in the lesion. The lesion's border appeared to be corticated, was smooth and well-defined, and was continuous with the lamina dura around the primary mandibular left second molar. According to previous dental records, the primary second molar had received pulp treatment with therapeutic agents containing calcium hydroxide and iodoform (Vitapex, Neo Dental Chemical Products, Tokyo, Japan). From these findings, this case was diagnosed as a radicular cyst associated with the primary mandibular left second molar.

The primary mandibular left first and second molars were extracted, and a bone biopsy and decompression were performed under local anesthesia. An impression was taken, and a specially designed removable space maintainer with an obturator was put in place to keep the wound open. The patient was taught to irrigate the cavity after each meal. Histologically, it was a cystic lesion with residual stratified squamous epithelium, granulation tissue, and leukocyte infiltration. The space maintainer with the obturator was checked every month, and the obturator was ground depending on bone growth and healing of the cyst (Figure 1b). The space maintainer was removed after eruption of the second premolar. After 2 years of follow-up, there had been no recurrence, and the mandibular second premolar had erupted normally (Figure 1c).

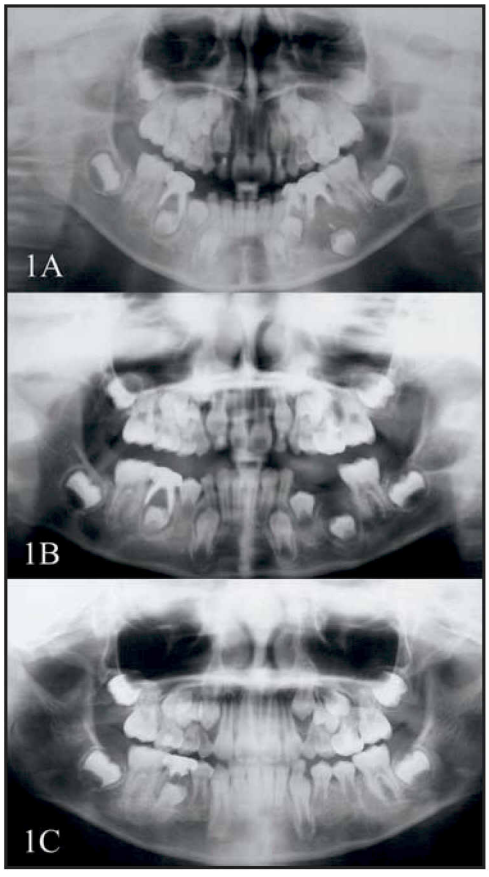

Figure 1. (A) Before treatment (6 years old); (B) 6 months after treatment (6½ years old); (C) 2 years follow-up (8 years old).

CASE 2

An 8½-year-old girl was referred from a local dental clinic for inspection of a painless swelling in the primary mandibular right molar region. Extraoral examination, a diffuse, nontender, hard bony swelling was noted on the mandibular body's right side. An intraoral examination revealed a grossly decayed primary mandibular right second molar, and showed a considerable buccal bony expansion. A panoramic radiograph showed a radiolucent unilocular periapical lesion, 3 x 2 cm in diameter, enclosing the partially formed crown of the permanent mandibular right second premolar (Figure 2a). This case was diagnosed as a radicular cyst associated with the primary mandibular right second molar, caused by the failure of pulp treatment.

The cyst was decompressed by the removal of the primary second molar and an acrylic resin obturator was used to keep the window open. The patient was instructed to irrigate the cavity twice a day with 10 ml of 0.12 percent chlorhexidene through a syringe. Radiographic follow-up at 3-month intervals to evaluate change and bony regeneration. The obturator was removed when the cyst's lumen was either not detectable on the radiographs or had shrunk to less than 1 x 1 cm in diameter. The permanent second premolar erupted in 1 year uneventfully (Figure 2b).

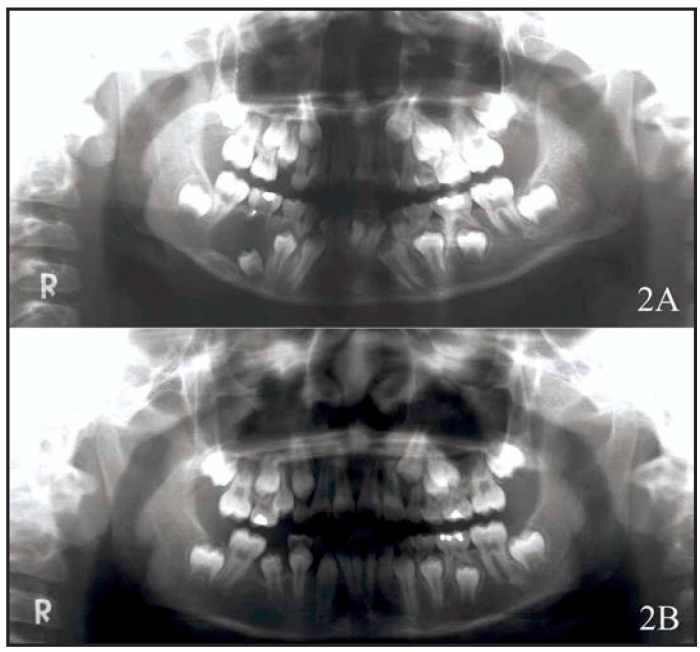

Figure 2. (A) Before treatment (8½ years old); (B) 1 year after treatment (9½ years old).

CASE 3

A 7-year-old healthy girl complained of swelling in the primary mandibular left molar region and lower lip's paresthesia. She had received pulp treatment for the primary left second molar. A panoramic radiograph showed a unilocular radiolucent lesion, 4.5 x 2 cm in diameter, under the primary mandibular left second molar (Figure 3a), which was severely displacing the succedaneous permanent second premolar beneath the first molar. A computarized tomographic scan showed a radiolucent bone lesion at the left mandibular angle and including the second premolar (Figure 3b and c).

According to these findings, a dentigerous cyst was considered. The primary mandibular left second molar was extracted and a decompression button was inserted. The pathological report confirmed a dentigerous cyst walled by attenuated ortho-polarized squamous epithelium and adjacent inflamed and edematous granulation tissue rich in neutrophils and plasma cells with patchy pseudoepitheliomatous squamous hyperplasia. There was no definite evidence, however, of ameloblastomatous change identified in the submitted tissue specimen.

After decompression for almost six months, there was new bone formation and the size of the cyst decreased. The cyst had decreased to 1 x 2 cm but the left second premolar was still severely displaced under the first molar's apex (Figure 3d). The position of the left second premolar was such that it would interfere new bone formation. In addition, the direction of the left second premolar was up side down, and the second premolar was almost impossible for normal eruption. At that time, the cyst exhibited no obvious change, and there was no new bone formation for several months. Therefore, under general anesthesia, the permanent first molar was extracted and cyst enucleation and an odontectomy of the left second premolar were performed. Then, the permanent first molar was immediately replanted.

Approximately 6 months later, a panoramic radiograph showed a periapical lesion at the apex of the distal root of the first molar (Figure 3e). The electric pulp test and thermal test of the first molar were both negative. Pulp necrosis was diagnosed and endodontic treatment was performed. Because the first molar was mesially inclined, orthodontic treatment was suggested. There was no recurrence after 4 years of close follow-up (Figure 3f).

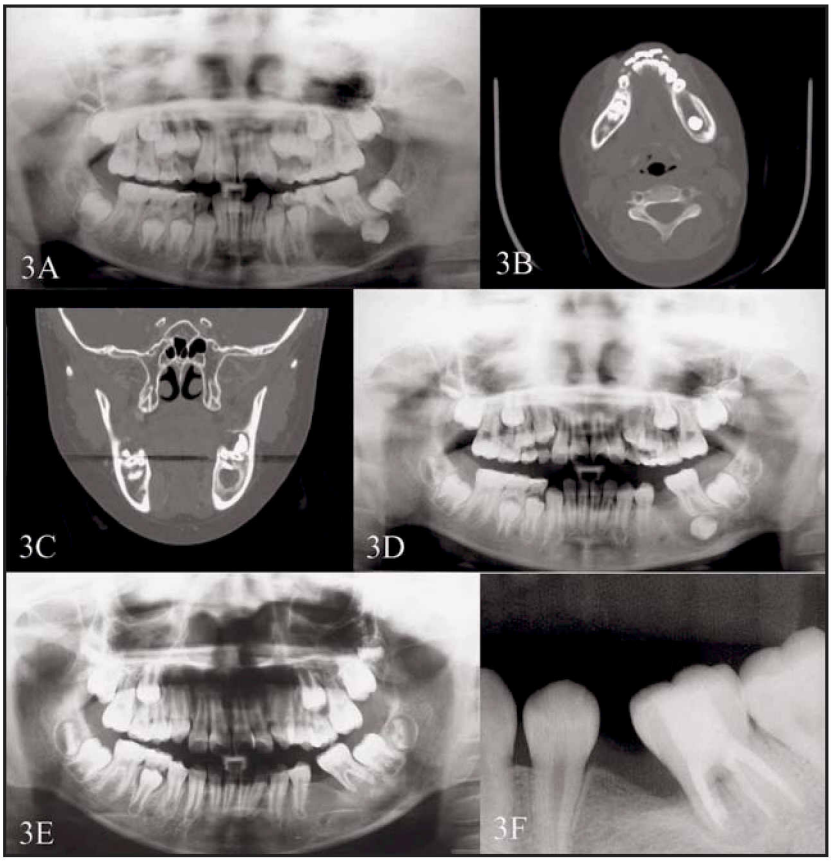

Figure 3. (A) Before treatment (7 years old); (B) CT scan in axial plane before treatment (7 years old); (C) CT scan in coronal plane before treatment (7 years old); (D) 6 months after first treatment (7½ years old); (E) 6 months after second treatment (8 years old); (F) 4 years after first treatment (11 years old).

CASE 4

A 3-year-old girl was referred from a local dental clinic for swelling of the mandibular left molar region for 3 weeks. The patient denied any history of trauma, and there was no caries over the primary left molars. A panoramic radiograph showed a unilocular radiolucent lesion, 5 x 2.5 cm in diameter, under the primary second molar extending to the mandibular angle and ramus (Figure 4a), severely displacing the permanent first molar and the tooth germ of the second molar. There was also displacement of the mandibular canal and resorption of the canal wall. The patient received decompression and bone biopsy under general anesthesia, and a decompression plug was put in place and fixed.

After 6 months of follow-up, the cyst's size had decreased and the first molar had continued to erupt (Figure 4b). Unfortunately, after 1 year of follow-up, the cyst grew again and the patient received a second decompression surgery under general anesthesia. The bone biopsy confirmed an inflammatory dentigerous cyst. The bony defect decreased, and new bone formed. The tooth germs of the second premolar and second molar were malpositioned and will require further treatment in the future (Figure 4c).

DISCUSSION

Odontogenic cysts develop from epithelial components of the odontogenic follicle or its remnants that lie entrapped within the bone

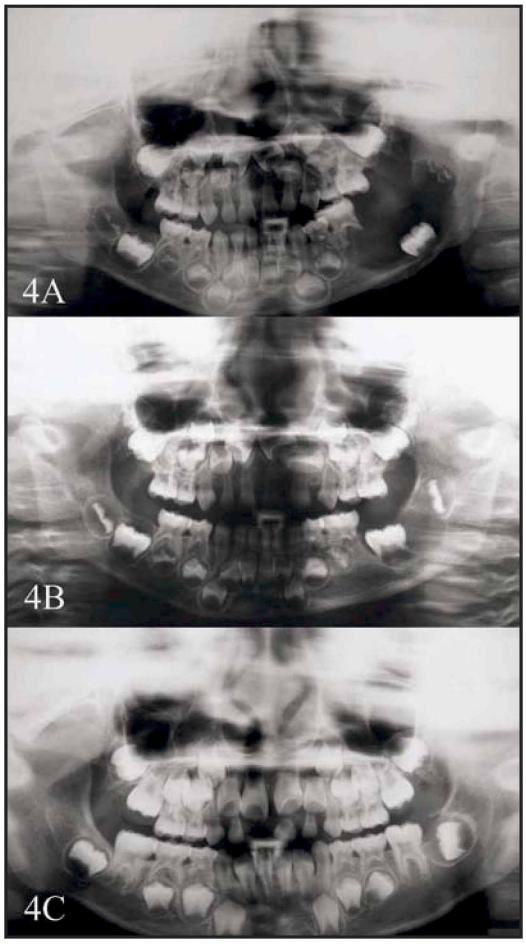

Figure 4. (A) Before treatment (3 years old); (B) 6 months after first treatment (3½ years old); (C) follow-up (7 years old).

or in the gingival tissue. Most radicular cyst development is the subsequent stage following the formation of a periapical granuloma. Many radicular cysts are asymptoms and are discovered when periapical radiographs are taken of teeth with nonvital pulp. Sprawson[11] stated that radicular cysts arising from primary teeth are less frequently seen than those from permanent teeth because of the biological cycle of primary teeth. In cases 1 and 2 of this report, there were no obvious pain symptoms in the process, but were discovered because of a large buccal bony expansion in the mandibular body.

Benn and Altini[6] proposed the existence of 2 types of dentigerous cysts: one developmental and the other inflammatory in nature. Developmental dentigerous cysts occur in mature teeth and are usually a result of impaction.[2,12] Case 4 is developmental and case 3 is the inflammatory dentigerous cyst. Inflammatory dentigerous cysts occur in immature teeth as a result of inflammation of a nonvital primary tooth or other source spreading to involve the tooth follicle. Persistent and prolonged irritation is a cause of and trigger for proliferation of the epithelial rests. Inflammatory exudates are induced by infection that spreads to the dental follicle, causing separation of the reduced enamel epithelium from the enamel. The formation and expansion of a dentigerous cyst may be affected by the timing of the spread of inflammation, duration of inflammation, position of the permanent tooth germ, and growth stage of the tooth germ.

The radiographic pattern of a radicular cyst may be identical to that of a periapical granuloma. A radicular cyst is usually unilocular,[9,13] with well-defined radiolucencies located both periradicularly and inter-radicularly. Loss of the lamina dura along the adjacent root and a round or oval radiolucent lesion circumscribed by a well-defined radiopaque line involving the tooth may be observed (cases 1 and 2). A dentigerous cyst is characterized by a unilocular radiolucent area that is associated with the crown of an unerupted permanent tooth (cases 3 and 4), while its corticoid margin is continuous with the tooth follicle at the cementoenamel junction of the permanent tooth.[6,14]

Histologically, the cyst's walls typically show linings of hyperplastic stratified squamous epithelium that exhibits intense inflammation. Shaw et al.[14] noted that distinguishing between dentigerous and radicular cysts on histologic grounds is difficult. A final diagnosis should be based on clinical and radiographic findings.

A pulpotomy, pulpectomy, and root canal treatment are used in cases of primary teeth with pulpitis or apical periodontitis. Side effects and damage to the permanent dentition have been reported.[13,15,16] Malpositioning, delayed eruption, enamel defects, discoloration affecting the permanent successors, and cyst formation are frequently reported side effects. Cases 1 to 3 in this study were treated endodontically with pulpal therapeutic agents.

Grundy et al.[9] examined a several cases of radicular cysts associated with the primary teeth. They recorded the time lapse between pulp therapy and the detection of buccal bone expansion to range from 5 months to 3 years, with an average of 20 months, and reported that pulp therapeutic agents may cause antigenic necrotic materials within the root canal which can provide continuing antigenic stimulation.

Patients with a radicular cyst (cases 1 and 2) do not experience pain unless acute inflammatory exacerbation is present. According to Livingston,[17] the growth rate of a radicular cyst is estimated to be approximately 5 mm in diameter annually. Hill[18] reported that the growth rate of a radicular cyst in the primary dentition was estimated to be 4 mm annually. If the cyst does enlarges and grow rapidly, symptoms such as buccal expansion, mild sensitivity, tooth mobility, and displacement of succedaneous teeth may occur.[8,9] The growth rate of cysts in all cases in this study was rapid and seemed to have exceeded 5 mm in diameter annually.

Most radicular cysts found in children are associated with primary mandibular second molars, teeth that are most frequently affected by dental caries.[4] In this report,

cases 1 to 3 were also primary mandibular second molars. Roots of these teeth are more closely associated with the follicle of their successors. Such an association may easily facilitate the spread of inflammation compared to other primary teeth.[13]

The normal treatment for radicular cysts includes total enucleation in the case of small lesions, marsupialization for decompression of large cysts, or a combination of the 2 techniques. In cases of primary teeth, treatment of choice is extraction of the primary tooth and preservation of the underlying permanent tooth (cases 1 and 2). Some clinicians only perform marsupialization,[6,9,13] whereas others prefer marsupialization and also pack the space with medicated gauze[13] to provide favorable conditions for healing. Exteriorization of the cyst at the time of decompression, resulting in communication with the oral cavity, often may lead to the commonly subepithelial inflammation. Inflammation is known to induce metaplastic change in epithelial cells as well as loss of parakeratinization.

In this report, the removable appliance with a resin projection was used to decompress the cystic lesion as well as prevent the entry of food debris into the cystic cavity and prevented the formation of fibrous healing tissues, which could have impaired the eruption of the permanent teeth.

Previous studies showed that extraction of a tooth and marsupialization result in rapid healing of the lesion and eruption of the permanent successor without requiring orthodontic treatment.[8,13,19] The objective of marsupialization or decompression is to alleviate the intracystic pressure through an accessory cavity. This technique was chosen because it was a more conservative intervention compared to enucleation of the cystic lesion. It was also more acceptable in that it prevented any damage to the crowns of the developing permanent teeth.

The appropriate treatment for a dentigerous cyst involving a permanent successor is extraction of the primary predecessor with inflammation and marsupialization. A radiolucent area that embraces the permanent tooth bud, ill-defined lesion borders, and retarded root development are pathognomonic signs of a damaged tooth germ.[7,8] In cases in which the permanent tooth is severely damaged, complete enucleation of the cyst and including the permanent tooth bud has been recommended.[7,8,20] In children, healing of the postsurgical osseous defects is always good, as they have a high propensity for bone regeneration (cases 3 and 4).

Although the literature considers radicular cysts in the primary dentition to be rare, some factors characteristic of primary dentition can lead to an underestimation of the true frequency of these lesions. This report illustrates how failure to detect and treat incomplete root resorption or periapical inflammation following pulp therapy in primary teeth can cause considerable morbidity. Therefore, primary teeth receiving pulpal treatment should be observed periodically. The cooperation of the patient and parents was fundamental.

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