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Research Paper

Enucleation vs Marsupialization of dentigerous cysts in children

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Abstract
Dentigerous cysts are common developmental odontogenic cysts found in the oral cavity. They are often discovered incidentally on dental X-rays or noticed as asymptomatic swellings. These cysts forms from reduced enamel epithelium that remains attached at the cementoenamel junction around the crown of an unerupted or impacted tooth. Although most dentigerous cysts are developmental, in young patients, they may also arise due to inflammation, often arising from decay in the primary teeth. Treatment options for dentigerous cysts range from marsupialization to complete removal, depending on the effect of the cyst on surrounding structures. The loss of a permanent tooth during the treatment of a dentigerous cyst can significantly impact a child's oral development. This article discusses 2 cases of primary teeth associated with cysts and their different treatment options.

Keywords*: cyst, enucleation, marsupialization, dentigerous cyst, surgical obturator.*

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I. Introduction

Dentigerous cysts are the most prevalent developmental odontogenic cysts occurring in the jaw, representing about 20-24% of all jaw cysts. These cysts form around the crown of an unerupted tooth due to the expansion of the dental follicle when fluid accumulates or a space is created between the reduced enamel epithelium and the enamel of the impacted tooth[1]. Dentigerous cysts always encompass the crown of an unerupted or impacted tooth. They are most found in the mandibular third molar region, followed by the maxillary canines, maxillary third molars, and, less frequently, the maxillary central incisors[2-4].

A dentigerous cyst grows beyond 2 cm in diameter[5] and may cause swelling, displacement of teeth, tooth mobility, and sensitivity. On radiographs, these cysts are typically seen as well-defined unilocular radiolucency, often associated with a sclerotic border surrounding the crown of an unerupted tooth. Histologically, a dentigerous cyst is characterized by a fibrous wall lined with non-keratinized stratified squamous epithelium, which may include myxoid tissue, odontogenic remnants, and occasionally sebaceous cells[6]. If left untreated, dentigerous cysts can lead to serious complications, such as pathological fractures, impaction of the permanent tooth, bone deformation, and even neoplastic transformations, including ameloblastoma and the development of squamous cell carcinoma or mucoepidermoid carcinoma[7]. Treatment options for dentigerous cysts typically involve either surgical removal of the cyst (enucleation), preservation of the involved permanent tooth, or enucleation of both the cyst and the affected tooth[8]. Alternatively, a marsupialization technique can be used. The cases discussed here focus on the management of dentigerous cysts in children using both techniques.

Case-1

A 14-year-old male patient was reported to the Department of Pedodontics and Preventive Dentistry with the chief complaint of swelling in the lower right back tooth region for the past 2 months. In the history of the present illness, the patient had a history of swelling that was gradually progressive and attained this size, leading to facial asymmetry. Swelling was associated with carious tooth and intermittent pain for 2 months, and the pain subsided after treatment with analgesics. On general examination, the patient was healthy and had no other bony lesions or defects in the body. There was no history of illness, hospitalization, or jaw trauma. On extraoral examination, facial asymmetry was noted on the right lower side of the face, with no sinus or active pus discharge. A single palpable swelling of 2x2 cm is present near the lower border of the mandible, which is firm in consistency. The submandibular lymph nodes on the right side of the mandible were enlarged, palpable, tender, and mobile, which suggested chronic infection from the tooth (figure-1). Intraoral examination revealed hard swelling in regions 44, 45, and 46 and obliteration of the buccal vestibule. The swelling was bony hard with expansion of the buccal cortex in regions 84 and 85 with no expansion of the lingual cortex (figure-2).

In the radiograph [orthopantomography (OPG)], an oval-shaped, unilocular radiolucency was noted around the developing 2nd lower molar with a radiopaque border. A lesion involving the apical portions of 44,45,46 and resorption of root of 1st molar is noted. (Figure-3) The contents of the swelling were aspirated and sent for investigation, which revealed thick blood mixed with mucoid material. Cytopathological examination of the aspirate revealed mucoid material, RBCs, clumps of benign epithelial cells, and numerous cyst macrophages. A provisional diagnosis of an inflammatory type of dentigerous cyst was made based on the above findings.

Since both the mandibular premolars and molars were involved in the cystic lesion, it was decided to do marsupialization of the cystic lesion followed by placement of a post-surgical obturator. 2nd molar (47) was surgically extracted, and marsupialization of the lesion was planned through the extracted socket to create a window allowing continuous drainage of the cystic content. The extracted site was irrigated with betadine solution and surgical obturator.

Follow-up examination revealed, gradual reduction of radiolucency after 15 days follow -up (figure-4). After 1month, an obvious reduction in the radiolucency seen at apex of 46. (Figure-5). After 3 months, there was a reduction in radiolucency, and bone formation was evident in the cystic cavity (Figure-6). After 6 months, there was a significant reduction in the radiolucency and the bone formation was evident in the cystic cavity. (Figure-7).

Figure 1: Extraoral view of the patient

Figure 2: Intraoral marsupialization and surgical obturator placement

Figure 3: Preoperative OPG

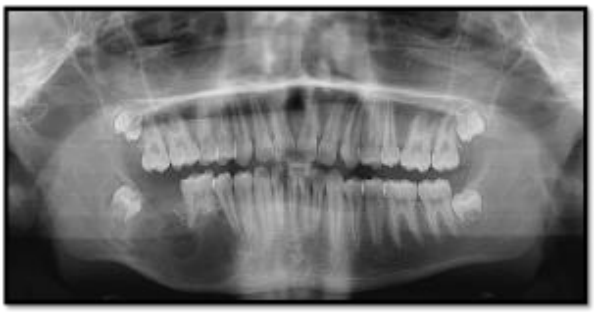

Figure 4: Post operative OPG after 15 days

Figure 5: Post operative OPG after 1month.

Figure 6: Post operative OPG after 3 months

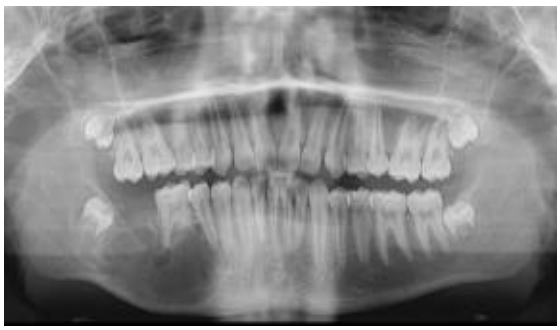

Figure 7: Post operative OPG after 6 months

Case-2

An 8-year-old male patient was reported to the Department of Pedodontics and Preventive Dentistry with the chief complaint of swelling in the right upper front tooth region for the past 6 months. In the history of the present illness, the patient had a history of swelling that was gradually progressive and attained this size, leading to facial asymmetry. Swelling was associated with carious tooth and intermittent pain for 6 months, and the pain subsided after treatment with analgesics. On general examination, the patient was healthy and had no other bony lesions or defects in the body. There was no obvious history of illness, hospitalization, or jaw trauma. On extraoral examination, facial asymmetry was noted on the right upper facial side, with no sinus or active pus discharge. A diffused swelling measuring approximately 3–4 cm is present in the right upper facial region, extending from the infra orbital ridge superiorly to the corner of the lip inferiorly and laterally 2 cm anterior to the tragus of the ear to the ala of the nose medially. On palpation, the swelling is soft and tender (Figure-8). On intraoral examination, diffused swelling extending from 51 to 16 with obliteration of the vestibular space is observed. On palpation, the swelling is soft, has a shiny surface, and is compressible and tender (Figure-9).

In the radiograph [orthopantomograph (OPG)], an unilocular radiolucency involving unerupted 13,14,15. Involvement of an unerupted tooth in the org and expansion of the cortical plate suggested the diagnosis of dentigerous cyst it 53,54,55 (Figure-10). The contents of the swelling were aspirated and sent for investigations, which revealed thick blood mixed with mucoid material. The treatment plan included surgical enucleation of the tumour along with the teeth associated with the lesion,51,52,53,54,55 and un erupted teeth 13,14,15. Cytopathological examination of the aspirate revealed mucoid material, RBCs, clumps of benign epithelial cells, and numerous cyst macrophages. A provisional diagnosis of a dentigerous cyst was made based on the above findings. Treatment included surgical enucleation of the lesion along with the teeth associated with the lesion 51,52,53,54,55, and unerupted 13,14,15 (figure-11,12) and specimens were sent for histopathological examination. Based on histological findings, the cyst was confirmed as a dentigerous cyst (Figure -13).

Figure 8: Extraoral view of the patient

Figure 9: Intraoral view of the patient

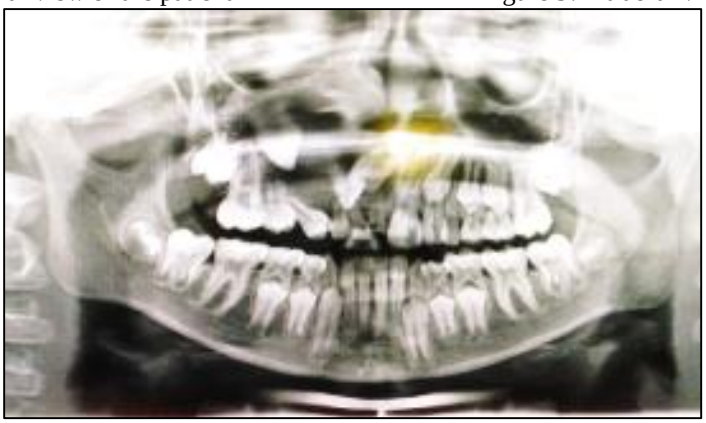

Figure 10: Preoperative OPG

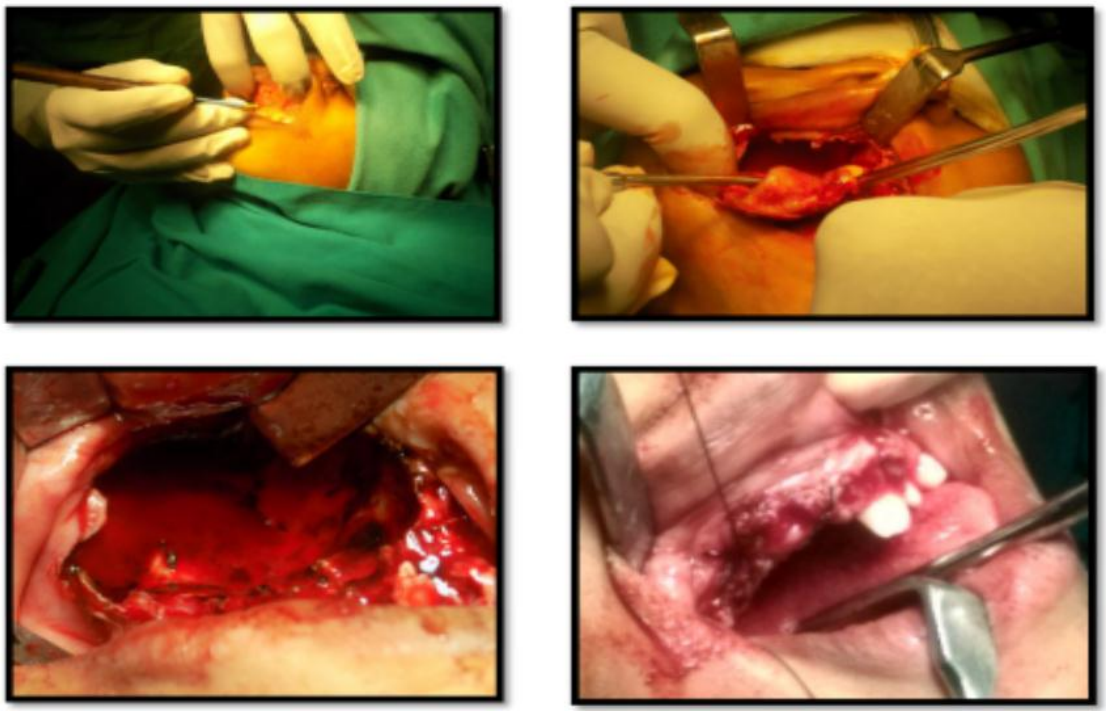

Figure 11: Surgical enucleation of Cystic lesion

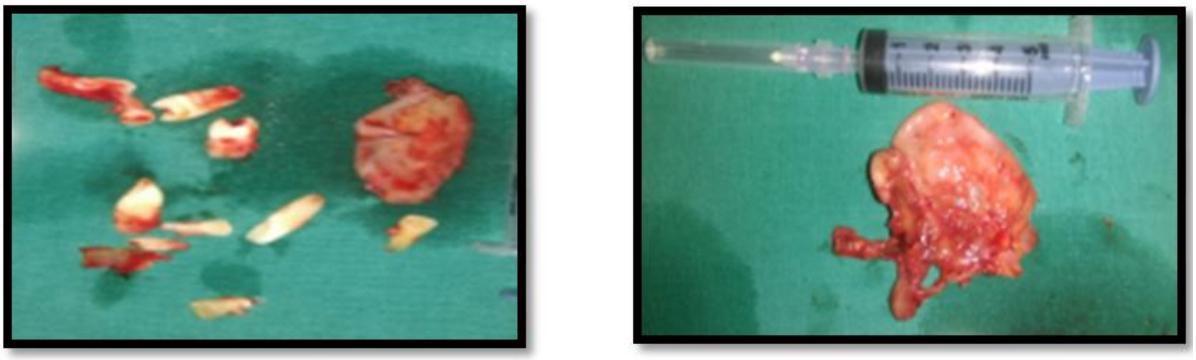

Figure 12: Excised cystic lesion and teeth extracted during surgical removal

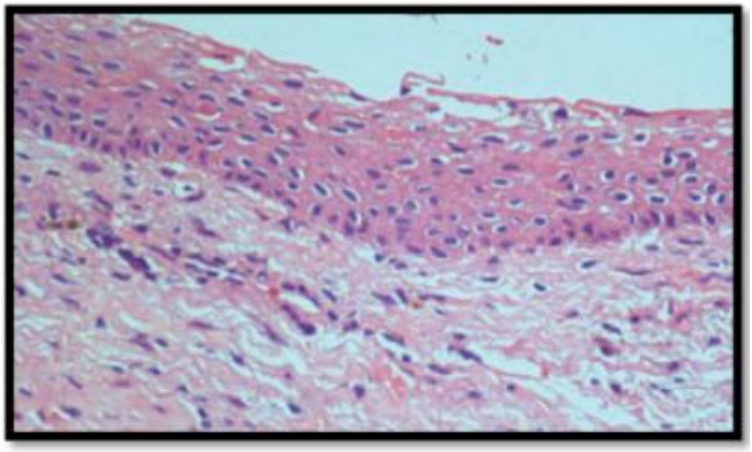

Figure 13: Histopathological view of excised lesion

II. Discussion

Dentigerous cysts can be classified into two types: developmental and inflammatory. Developmental dentigerous cysts typically form around the crown of an unerupted tooth due to fluid accumulation either between the reduced enamel epithelium and the enamel or within the enamel organ layers. Fluid buildup is often a result of the pressure exerted by an erupting tooth on the impacted follicle, which impedes venous outflow and causes rapid transudation of serum through the capillary walls. Another theory suggests that these cysts arise from the degeneration of proliferating cells in the follicle following delayed tooth eruption, leading to increased osmotic pressure and subsequent cyst formation. In contrast, the inflammatory type of dentigerous cyst is believed to originate from inflammation caused by a necrotic deciduous tooth. This periapical inflammation can extend to the follicle of the unerupted permanent successor, resulting in the formation of a dentigerous cyst[9-11].

Dentigerous cysts are most frequently diagnosed in individuals in their 20s and 30s [12]. However, they are less common among children 4–9% occurring within the first decade of life. A histological evaluation of cysts found during the mixed dentition stage revealed that in 93.6% of cases, the cysts were associated with inflammation caused by the primary tooth [13-14]. When diagnosing dentigerous cysts, it is important to differentiate them from other conditions, such as large periapical cysts, odontogenic keratocysts, central giant cell granulomas, and uni-cystic ameloblastoma, which can appear similar on radiographs. Radiography alone cannot reliably distinguish these lesions, especially when they are associated with the roots of nonvital or vital primary teeth that affect the crown of a developing permanent tooth. Thus, fine-needle aspiration cytology (FNAC) and histopathological examination of cyst contents and lining are necessary for accurate diagnosis[15].

The epithelial cells lining the lumen of dentigerous cysts can undergo metaplastic transformation. If left untreated, these cysts may occasionally develop into odontogenic tumours, such as ameloblastoma, and malignancies, including oral squamous cell carcinoma. To prevent these complications, marsupialization or surgical removal of the cyst lining may be recommended[16.]

Considering these findings, eliminating the source of inflammation, such as the primary mandibular right first molar, is crucial. Techniques like marsupialization, decompression, and the Partsch procedure involve creating a surgical opening in the cyst wall, draining the cyst contents, and maintaining communication with the oral cavity, maxillary sinus, or nasal cavity. The proposed method reduces intra cystic pressure by creating an

additional cavity. Hence, this approach is considered conservative and particularly suitable for larger cysts, which are often near developing permanent tooth buds[17].

The cyst must remain open to reduce the intra cystic pressure and encourage bone growth. Various devices, such as simple iodoform gauze, stents, brackets, and chains attached to impacted teeth, or removable partial dentures serving as obturators, can be used to achieve this. In our cases, we used a postsurgical acrylic obturator, which was secured intraorally with clasps. This obturator features a vertical acrylic extension that fits into the marsupialization site, keeping it open. The vertical extension is adjusted based on the clinical condition and eruption status of the permanent tooth during follow-up visits. We did not encounter common complications, such as infection or opening closure[17-18].

Complete eruption of the affected permanent teeth and healing of the cystic cavity were observed after 12 months, which was slightly longer than the average decompression duration of 7.5 months reported by Allon et al. Previous case reports, including ours, have shown that permanent teeth can erupt into the dental arch even when significantly displaced. According to a study by Nahajowski et al., a younger patient age (around 10 years) and root formation less than half its full length appear to increase the likelihood of spontaneous eruption [19-20]. Sharp and Helsper have shown that a dentigerous cyst prevents the eruption of a developing tooth germ because it is involved in mechanical obstruction in the eruption path. The treatment method is influenced by several factors, including the patient's age, the cyst's location, the tooth's position in relation to the cyst, and the extent of axial inclination and root development. When a cyst is linked to a supernumerary tooth, fully removing the cyst along with extracting the tooth is often the preferred approach. The treatment for a dentigerous cyst is typically surgical, which often involves enucleation and extraction of any teeth embedded within or affected by the cyst. For particularly large cysts, initial marsupialization of the lesion to the oral cavity followed by enucleation is recommended. Although Kaban suggested that occasionally preserving a tooth is an option, he emphasized that complete enucleation should always be the priority[21].

Children have a greater ability to regenerate bone structure than adults, and teeth with open apices exhibit a strong potential for eruption. These factors are particularly important in children with large dentigerous cysts because they contribute to a more favourable prognosis for the affected teeth[21].

III. Conclusion

The selection of treatment for a dentigerous cyst depends on several factors, including the patient's age, cyst size, and location; the position of the tooth relative to the cyst, proximity to vital structures, and degree of axial inclination and root development. In young patients, marsupialization is often considered a favourable or preferred treatment option.

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