

Review

Types, Complications, and Prognosis of Inflammatory and Developmental Odontogenic Cyst

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Abstract

In general, odontogenic cysts might have an inflammatory or developmental origin. The review study aims to increase understanding of the various categories of odontogenic cysts by describing their primary characteristics, consequences, treatments, and prognoses of lesions. Different types of developmental odontogenic cysts are the dentigerous cyst, eruption cyst, odontogenic keratocyst (OKC), orthokeratinized odontogenic cyst (OOC), gingival cyst (adult and new-born), lateral periodontal cyst (LPC), glandular odontogenic cyst, and calcifying odontogenic cyst (COC). Periapical or lateral radicular cysts, residual cysts, and paradental cysts are forms of inflammatory odontogenic cysts. The mandible and maxilla are affected by these inflammatory lesions. The most prevalent developmental odontogenic cysts were dentigerous cysts and OKC. Most developmental cysts reported rare recurrence and excellent prognosis except for glandular odontogenic cysts (30 to 55% recurrence) and OKC (30%). Glandular odontogenic cysts, OKC, and COC have the propensity to behave aggressively and recur frequently compared to others. Although most inflammatory cysts are asymptomatic and benign, because of their continuous growth, these lesions have the potential to become destructive because they damage and infect the nearby bone. Malignant transformation has been reported in periapical and residual inflammatory cysts. As a result, they should be properly diagnosed and treated. All inflammatory cysts have a favorable prognosis.

Keywords: *Odontogenic, cysts, inflammatory cysts, developmental cyst*

Introduction

Odontogenic cysts are one of the most common lesions affecting the jaws (1); they account for 90 to 97% of documented cysts in the oral area. These cysts arise from the epithelial part of the odontogenic apparatus or its remnants that lie entrapped within the bone or gingival tissue (2-4). The cystic proliferation and degeneration of the epithelium are considered to lead to the development of odontogenic cysts (5). The World Health Organization broadly classified odontogenic cysts into developmental and inflammatory cysts based on their pathogenesis. Although the cause of developmental cysts is uncertain, an inflammatory process does not seem to be the cause of them. As their name implies, inflammatory cysts are associated with inflammation. Its slow, expansile, and non-infiltrating growth pattern constitutes clear evidence of its benign nature—a situation that may facilitate a late diagnosis. However, these cysts can occasionally cause significant jaw swelling, pain, and infection. Some of the developmental cysts reported aggressive behavior and a high recurrence rate, which mandates regular follow-up.

Developmental odontogenic cysts and inflammatory odontogenic cysts are epithelial lesions; they can enlarge if they are not detected in time and treated properly (4). Since many cystic lesions of the jaw exhibit similar radiographic and clinical characteristics, the evaluation of odontogenic cysts often requires a thorough examination of clinical, radiographic, and histopathologic data. The treatment of choice is conditioned by several factors, such as the size of the lesion, its location, the possible involvement of neighboring anatomical structures, or damage to dental structures.

Numerous case studies involving inflammatory and developmental cysts of odontogenic origin have been published. By stressing the significance of treatment management and prognosis lesions and by detailing the characteristics, complications, and key components of the many forms of odontogenic inflammatory cysts, this review seeks to increase understanding of these lesions.

Discussion

Developmental odontogenic cyst

Developmental odontogenic cysts do not seem to have an inflammatory basis in their pathophysiology. They are typically asymptomatic, but they have the capacity to get massive and cause cortical growth and erosion. The jaws may be destroyed by some aggressive developmental cysts, or they may recur. Many research studies and case

reports have been published around the world. The following section provides a thorough explanation of the characteristics, complications, treatment, and pathogenesis of the developmental cyst sub-classification.

Dentigerous cysts (follicular cysts)

Dentigerous cysts are also referred to as follicular cysts and are the most prevalent developing cysts that most frequently affect the maxillary third molars (wisdom teeth), maxillary canines, and, in rare cases, the maxillary central incisors (6, 7). They account for 24% of all cysts in the jaw. Although dentigerous cysts are mild, they can lead to severe complications, such as infection and tooth loss, if left untreated. It is more common in the second and fourth decades of life, but it is rare in childhood because it only occurs in the secondary dentition (8, 9). They are frequently asymptomatic and are discovered by chance during a routine radiographic examination. Symptoms of dentigerous cysts include tooth sensitivity, swelling, tooth displacement, a small bump where a tooth is supposed to erupt, and gaps between displaced teeth.

Enucleation or marsupialization as well as the extraction of the related tooth are the treatment options for a dentigerous cyst. Enucleation is necessary when the cyst neighboring a supplemental tooth or if the cyst-associated tooth is not expected to erupt either spontaneously or through extrusion (5). While large cysts require marsupialization, a conservative surgical procedure that gradually shrinks the cyst in size, massive infected dentigerous cysts may require marsupialization along with extrusion of the affected tooth (10). The prognosis for dentigerous cysts is good, with no chance of recurrence. However, an uncommon complication is the development of ameloblastoma from the cyst lining or odontogenic epithelial rests within the cyst wall (11). Malignant transformation may occur in rare entities, which is a slow process that can take up to 30 years. There have been reports of squamous cell carcinoma developing from a dentigerous cyst (12). In addition to that, cases have been reported of dentigerous cysts evolving into mucoepidermoid carcinoma (MEC) (13-15) as well as case reports of MEC with a predominantly cystic appearance and many mucous cells in the lining (14, 16).

Eruption Cyst

Eruption cysts are a type of soft tissue that is similar to a dentigerous cyst but is recognized as a distinct clinical entity (17). It arises from the accumulation of cystic fluid

or hemorrhage, or both, between the crown of an erupting tooth and the surrounding dental follicle. Clinically, it manifests as an expansion of the alveolar mucosa that is translucent, blue, bluish, or blue-black over a temporary or permanent tooth in eruption. The majority of eruption cysts occur in the incisal and molar areas, followed by the canine and premolar areas (17). Most of the cases involve children under the age of ten. Although such lesions can develop over any erupting tooth, they are most often associated with primary incisors and first permanent molars.

Mostly, the eruption cysts do not require treatment, and the majority of them disappear on their own. If the lesion leads to pain, causes bleeds that are infected, or affects the quality of life, surgical intervention may be required. Simple incision or partial excision of the overlying tissue to expose the crown and drain the fluid is indicated when the underlying tooth is not erupting or the cyst is enlarging (18).

Odontogenic keratocyst

Odontogenic keratocyst (OKC) is locally aggressive, benign intraosseous lesions of odontogenic origin that account for about 10% of jaw cysts (19). The incidence age distribution is between 8 and 12, with a preponderance in the third decade of adulthood (20-22) and a male predominance (23). The mandible experiences them twice as frequently as the maxilla (24). Large-size lesions are particularly common at the ramus and angle of the mandible (25). Approximately 30% of OKC have no relationship with any dental structure (23, 26). According to the literature, OKCs may be detected in a periapical position, a pericoronal position, or a lateral root position (27). The majority of reported cases of OKC result in only minor bone expansion. However, large lesions significantly erode the cortical plates and impact the structures around them (28). MacDonald-Jankowski et al. demonstrated that patients of East Asian descent may exhibit symptoms early, characterized by swelling and pain, whereas patients of Latin American origin are more likely to describe discharge and numbness of the inferior alveolar nerve (29).

These cysts are more aggressive and recur more frequently than any other odontogenic cysts (27), and they are sometimes associated with the necessitated basal cell carcinoma syndrome. The treatment of choice is enucleation or resection without a continuity defect. Resection has a documented 0% recurrence rate; however, it can have significant morbidity. Enucleation combined with adjuvant therapy, such as cryosurgery

and decompression (1–8%), has a lower recurrence rate than enucleation alone (17–56%) (30). The average recurrence rate for OKC is 30% (26). The existence of residual epithelium or an epithelial remnant following the enucleation of the lesion is one of the main hypothesized contributing causes for the greater rate of recurrence (31). Satellite cysts in the cyst's wall are another factor (32). For these reasons, OKC must be properly recognized.

Orthokeratinized odontogenic cyst

Orthokeratinized odontogenic cysts (OOC), a rarely seen developing odontogenic cyst, were once classified as odontogenic keratocysts. Subsequent studies revealed that OOC is a distinct clinical entity from odontogenic keratocysts both clinicopathologically and physiologically (33). They show a number of distinctive pathologic, clinical, and behavioral characteristics that vary substantially from keratocystic odontogenic tumors. Most of the reported patients were young adults with male predominance (34); with a peak incidence in the third decades of life (19). The mandible is affected more than the maxilla, with a predilection for the most posterior region. These orthokeratinized odontogenic cysts represent 10%–13% of keratinizing odontogenic cysts (35-37). Approximately 75% of OCCs are related to impacted teeth, thereby radiographically and clinically mimicking a dentigerous cyst (35, 37, 38).

The age, location, and size of the lesion are among the variables that influence the best course of treatment. Orthokeratinized odontogenic cysts are often treated by curettage and enucleation (38, 39); however, decompression or marsupialization is effective as an adjunctive or even definitive treatment (40). Other adjuvant treatments included the Carnoy solution, peripheral ostectomy, and cryotherapy (40-42). The prognosis after enucleation is excellent, with an approximate recurrence rate of 4% (43).

Gingival Cyst

A gingival cyst in an adult is rare (0.3% of all odontogenic cysts), small, developmental cyst of gingival soft tissue occurring in either the free or attached gingiva (44). However, neonates commonly experience gingival cysts, which are only occasionally observed after the first two months after birth (45). In adults, it happens in their fifth and sixth decades of life. It occurs less frequently in the maxilla and more frequently in the canine and premolar portions of the mandible. Clinically, the gingival cyst is less than 6 mm in diameter, presents as a painless, flesh-colored

enlargement that may occasionally have a bluish tint from the cystic fluid and destroys the labial bone under pressure (46). The main differential diagnosis of a gingival cyst is a lateral periodontal cyst (47).

In a newborn, no treatment is indicated for gingival cysts because the lesions spontaneously involute as a result of the rupture of the cysts and resultant contact with the oral mucous surface, and the lesion is rarely seen after 3 months of age. However, in adults, gingival cysts respond well to simple surgical excision with a rare chance of recurrence (3.2%) (44).

Lateral periodontal cyst

Lateral periodontal cysts (LPC) are another type of developmental cyst. LPC's genesis and growth have been attributed to the cell remnants of Malassez, decreased enamel epithelium, or dental lamina remnants (48-50). It is more common in the mandible, primarily on the lateral part of premolar-canine root regions. It is a rare entity in young adults, usually found in the fifth and seventh decades of life. Male preponderance was reported in previous investigations (51).

LPC is treated conservatively with surgical enucleation and thorough curettage of the cystic lining to remove any remnants (52, 53). A recent case review reported that LPC can be successfully managed with guided bone marrow regeneration along with surgical management (54). Lateral periodontal odontogenic cyst recurrence is rare (approximately 2.5%) (55).

Glandular odontogenic cyst

The glandular odontogenic cyst (GOC), a rare aggressive cyst of the jawbone, is of odontogenic origin. The mandibular anterior (70%) region is where GOC most frequently develops (56), and it manifests as a slow-growing, asymptomatic swelling (57). The fourth and fifth decades of life are significantly impacted. The size of the cyst can vary from less than 1 cm in diameter to large, destructive lesions that involve most of the jaw. Small lesions were identified incidentally in radiological examination with well-defined borders and buccolingual expansion. Kaplan et al. suggested specific pathologic diagnostic criteria for GOC (58). The most common clinical symptom is swelling; infrequent findings include pain, secondary infection, and paresthesia.

The treatment of choice included curettage, enucleation, en bloc, and partial osteotomies (59); however, most glandular odontogenic cysts have been treated by enucleation or curettage. En bloc resection is

suggested for the lesions noted with a tendency for recurrence among large multilocular lesions with cortical perforation (58-62). However, a high recurrence rate of approximately 30% to 55% has been reported (58). The aggressive biologic behavior of GOC and its propensity for recurrence might be associated with cell kinetics in the epithelium (59). Therefore, a frequent interval and extensive follow-ups are required.

Calcifying odontogenic cyst

Calcifying odontogenic cysts (COC), or Gorlin's cysts, are locally aggressive and slow-growing lesions that account for less than 2% of all odontogenic cysts (63, 64). It appears to be painless and slow growing most of the time. It mostly affects the maxilla and mandible and often affects the first molar teeth (65). COC primarily affects people in their second decade of life, though it has been reported to affect people of all ages (66). It may result in lingual enlargement, root resorption, tooth displacement, and cortical bone perforation (67). Radiographically, it may appear as a unicystic or multicystic well-bordered radiolucent mass (67). Unerupted teeth are linked to almost half of the instances of COC (68, 69).

Simple enucleation and curettage are the treatments of choice for COC, and the prognosis is good. Even with conservative therapy, less than 5% of cases recur. Methods such as marsupialization or decompression are indicated for extensive lesions, mainly to preserve adjacent noble structures (70). For peripheral lesions, conservative excision is typically curative.

Inflammatory odontogenic cyst

Inflammatory odontogenic cysts, which include inflammatory periapical cysts, paradental cysts, and residual cysts, are benign osteolytic lesions that are usually asymptomatic. It accounts for between 70.1% and 85% of all maxillary cysts. The following section provides a thorough explanation of the characteristics, complications, treatment, and pathogenesis of the inflammatory odontogenic cyst sub-classification.

Periapical cyst (lateral radicular cyst)

The periapical cyst, also known as the lateral radicular cyst and the apical periodontal cyst, is a very common inflammatory type of odontogenic cyst and accounts for over 50% of total odontogenic cysts (71). It consists of a lateral periodontal cyst and an apical radicular cyst. Males predominate, and the occurrence of periapical cysts is higher during the third and sixth decades of life. It mostly affects teeth with infected and necrotic pulp.

Most reported radical cysts are asymptomatic, small, and slow-growing, and are discovered accidentally when radiographs are taken (72). Radicular cysts develop from the epithelial remnants of the periodontal ligament as a result of inflammation, migration, and infiltration of inflammatory cells such as leukocytes and monocytes, which is an effect of pulp necrosis (73). Most reported cases of radicular cysts were in molar teeth with apical infections caused by caries. It has been reported that radicular cysts associated with primary incisor teeth are very rare (74, 75).

Typically, conservative non-surgical, minimally invasive endodontic orthograde treatments or surgical interventions are used to treat periapical cystic lesions. Surgical treatment includes enucleation, marsupialization, decompression, and cystectomy (76). Surgery is indicated if the canal cannot be dried to complete the three-dimensional obturation of the endodontic system or if endodontic orthograde therapy cannot be performed because of various obstructions present in the root canal (77). Inflammatory periapical cysts are currently treated by shaping and obturating the root canal instead of performing urgent surgery. Inflammatory periapical cysts are currently treated by shaping and obturating the root canal instead of performing urgent surgery (78). Some inflammatory periapical cysts can only be treated with endodontics (79). The surgical removal of the inflamed periapical cyst improves the prognosis. Squamous cell cancer has rarely been found to form in periapical cysts (80).

Residual cyst

The inflamed periapical cyst causes the development of the residual cyst, a form of inflammatory odontogenic cystic that remains in the bone following extraction of the afflicted tooth. It is one of the most common cystic lesions in the jaws, accounting for around 10% of all odontogenic lesions (81). As a result, persistent cysts form at the sites of healing extractions. Children are rarely encountered with residual cysts. It can occur at any age and is typically diagnosed in middle-aged individuals in their third decade of life but can also present as early as the second to the eighth decades of life (82), with a male predominance and segments of the mandible appearing to be more frequently affected (83).

Residual cysts are usually surgically managed by enucleation, marsupialization, or decompression to decrease the intraluminal pressure within the cyst. Smaller lesions can be enucleated entirely at the time of biopsy, which is the ideal treatment choice. Enucleation

was shown to be an acceptable method in this sample with a low morbidity and recurrence rate. However, there are some contraindications to enucleation, such as difficult accessibility, proximity to adjacent vital structures, large lesions, and the patient's age. Hence, high-risk patients, younger individuals, and the elderly should be managed with minimally invasive procedures to reduce morbidity (84). These cysts have reported a low recurrence rate (1.6%) following enucleation; hence, the prognosis following surgical management is good (83). However, malignant transformation has been reported (80).

Paradental cyst

The paradental cyst is a rare inflammatory odontogenic cyst, and it accounts for 1%–5% of all odontogenic inflammatory cysts (85-87). It has a partial eruption that extends along the root surface, is adherent to the cemento-enamel junction of a tooth, and is related to pericoronitis, an inflammation of the gingiva that causes hyperplasia and cyst formation. According to the research, the growth of enamel projections or ridges extending into the buccal bifurcation of dental roots is associated with the pathophysiology of paradental cysts (85, 88, 89). A paradental cyst is a slow growing, often painless lesion since it takes a long time for epithelial remnants to proliferate and create cysts. Discomfort, swelling, halitosis, delayed eruption, severe pain, suppuration, pain during occlusion, and trismus may occur in some instances. Treatment for a paradental cyst that is connected to a third molar involves excision of the cyst along with tooth removal. The majority of reports indicate that when a first or second molar is affected, the treatment of choice involves enucleating the lesion while preserving the tooth (85, 90-93). Whereas surgical excision of the tooth and the paradental cyst has been considered the best-case solution when the third molar is involved (92, 94, 95). The prognosis for paradental cysts is favorable, and recurrence is quite uncommon. When the lesion is eliminated, there is no likelihood that it will recur. In the cystic region, bone regeneration is frequently seen after surgical excision.

Conclusion

Most developmental cysts reported rare recurrence and excellent prognosis except for glandular odontogenic cysts (30 to 55% recurrence) and OKC (30%). Glandular odontogenic cysts, OKC, and COC have the propensity to behave aggressively and recur frequently compared to others. Although most inflammatory cysts are asymptomatic and benign, because of their ongoing

growth, these lesions pose a risk of becoming harmful since they can impact and infect the nearby bone. Hence, they should be properly treated. The prognosis for all inflammatory cysts is good. After receiving the necessary management, these cysts typically do not recur. However, rare malignant transformations have been reported in some cases.

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Conflict of interest

There is no conflict of interest

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Data availability

Data that support the findings of this study are embedded within the manuscript.

Author contribution

All authors contributed to conceptualizing, data drafting, collection and final writing of the manuscript.

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