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# **Management of Odontogenic Cysts : Review of Literature**

A project submitted to the college of dentistry, University of Baghdad,  
Department of Surgery in partial fulfilment for the Bachelor of Dental Surgery

By

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## **Certification of The Supervisor**

I certify that this project entitled “**Management of odontogenic cysts;review of literature** “ was prepared by the fifth-year student Mustafa Mowfaq Abed under my supervision at the College of Dentistry/University of Baghdad in partial fulfillment of the graduation requirements for the Bachelor Degree in Dentistry.

Supervisor's name:

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## **Supervisor's Dedication**

Firstly and lastly, all gratefulness and faithfulness thanks and praises are to "Allah" God of the world.

I want to dedicate my graduation project to my family especially my parents, who supported and encouraged me and my friends

# Acknowledgment

Firstly, all gratefulness, faithfulness to ALLAH.

For providing me with patience, perseverance, and the ability to undertake and complete this project

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Because it is difficult to compensate for the fatigue, effort and sacrifices that they make. Donating the best effort is the only expression of thanks and gratitude for their presence. For the secret of my success and progress in this difficult life, the source of my inner strength . My father Mowfaq Abed and My mother Suzan Hameed .

At the time that my graduation project come to an end, my appreciation to all those and to everyone who helped me and work with me during the hard times.

## **Abstract**

Odontogenic cysts encompass a large group of cysts with a varied clinical picture and size and positions ranging from small gingival cyst to large cysts and their destructive effect on the bone. An appropriate treatment protocol needs to be followed to stop the inflammation and its effect. This project aims to give an understanding of the odontogenic cysts, their effect and the therapy strategies employed to treat them.

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## List of Abbreviations

<i>OKC</i>	Odontogenic Keratocyst
<i>Er, Cr-YSGG</i>	erbium, chromium, yttrium, scandium, gallium garnet
<i>5FU</i>	Fluorouracil
<i>GCA</i>	Gingival cyst of adults
<i>LPC</i>	Lateral periodontal cyst
<i>BOC</i>	Botryoid odontogenic cyst
<i>GOC</i>	Glandular odontogenic cyst
<i>COC</i>	Calcifying odontogenic cyst

## **1.1 Introduction**

Odontogenic cysts are generally classified as inflammatory or developmental. Radiographically, they present as a unilocular or multilocular radiolucent lesion with distinct borders; however, they cannot be differentiated radiographically. In addition, odontogenic cysts may share similar radiographic appearances with aggressive odontogenic tumors.

Odontogenic cysts are frequently identified on routine examinations with head and neck imaging such as orthopantomograms and computed tomography (CT). Clinicians must obtain a complete medical history and perform a thorough head and neck exam on all patients. In evaluating odontogenic cysts, the clinical examination and interpretation of radiographic studies are essential phases; however, tooth vitality testing is equally important. Tooth vitality testing is required in formulating an appropriate differential diagnosis for odontogenic cysts. This step is essential in determining treatment and ultimately guides patient outcomes.

## **1.2 Aim of Study**

This study aims to show the modalities of dentigerous cyst treatment, their indications, advantages and disadvantages, as well as the criteria for choosing each technique via a narrative literature review and to give a review about the most common odontogenic cysts, etiologies, clinical and radiographical features, appropriate therapies, managing, and treating patients with these entities

## **1.3 Review of Literature:**

Cysts are most frequently treated surgically. The treatment modalities have evoked the greatest debates and controversies because of the size, localization, pathological formation and recurrence potential of the cysts. Management of cysts should focus on selecting the best modality that carries the lowest possible risk of recurrence and minimum morbidity. Management options can broadly be divided into conservative treatment and radical management. Conservative treatment aims at preserving the bony architecture as much as possible while removing the pathology as in marsupialization or decompression. More aggressive forms of management are enucleation with/without curettage along with adjunctive uses of chemical/cryocauterization or resection. **(Fickling BW 1965)**

## **2.1 Modalities of management of Odontogenic Cysts:**

There are several types of possible treatments for dentigerous cysts, among them are: enucleation, marsupialization, decompression, cryotherapy, endoscopy, and a combination of these treatments. The first three are the most commonly used. **(Oliveira HCC Jr et al.,2014)** It is of fundamental importance that the choice of treatment be the best possible for the patient and the cyst. The appropriate choice is made based on the size, age, and location of the cyst. Prognosis is favorable when the cyst is removed completely, but, although rare, they may turn into an ameloblastoma or some malignant neoplasm. **(Caliento R et al.,2013)**

### **2.1.1 Enucleation**

Enucleation is a radical method for removing all the cystic capsule. The chosen treatment plan whenever the cyst is small, and saving the involved tooth is impossible. **(Berden J et al.,2010)**

Many authors differ in their opinion with regard to enucleation of large dentigerous cysts. This is largely due to the fact that larger cystic cavities lack organization of a blood clot and formation of new bone is questionable. A blood clot in a devitalized area is a great risk, as it can easily become infected and may lead to the unwanted consequences of local inflammation. **(Arakeri G et al.,2015)**

However, various studies have shown predictable spontaneous bone regeneration in young patients after enucleation of such large cysts. **(Arakeri G et al.,2015)**

In 1965, Fickling enumerated the types of enucleation of cysts as follows:

1. ***Enucleation and closed by suture:*** Enucleate the cyst lining completely and close the intra-oral incision. This is the ideal, but closure should only be carried out when the operator is clinically certain that enucleation has been complete. This is also called Partsch I. **(Partsch C et al.,2005)**
2. ***Enucleation and packed open:*** Enucleate the cyst and open widely to the mouth. This is indicated when enucleation has proved so difficult that it might be incomplete or when the cyst is so large that, even with antibiotics or space-filling materials, breakdown might occur if the wound is closed. The resulting cavity fills quite rapidly.

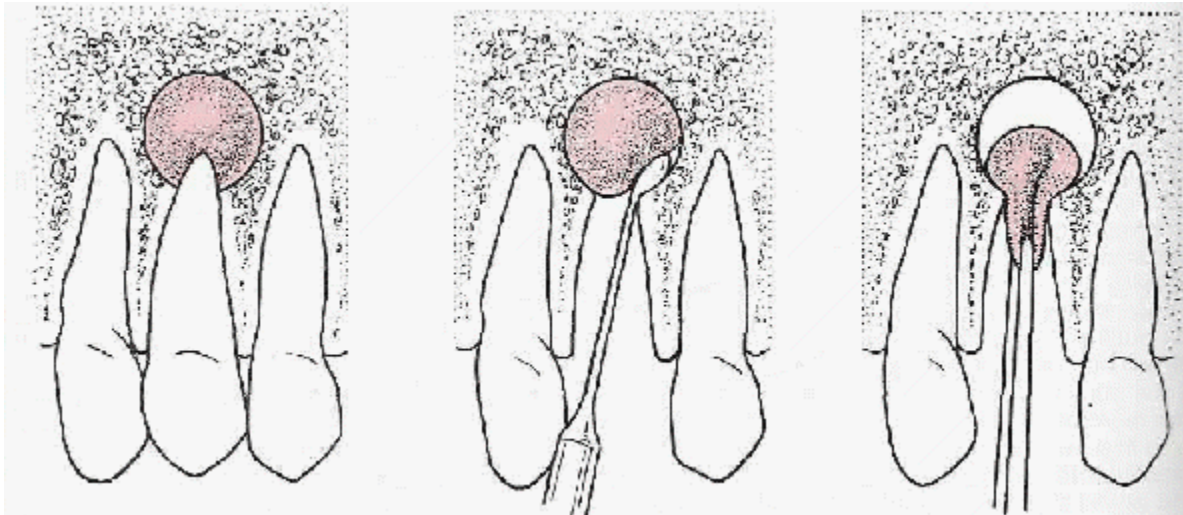


Fig 1 : Enucleation of a cyst

### 2.1.2 Marsupialization

Marsupialization is the conversion of a cyst into a pouch by suturing the cyst lining to the oral mucosa. This conservative method is used, if the preservation of the displaced teeth is desirable, especially in a young patient. It is also used if the cyst is large and there is a possibility of destruction of the surrounding tissue and a pathologic fracture of the mandible. **(Khandeparker RV et al.,2018)**

This method has fewer complications than enucleation regarding the preservation of important anatomical structures and developing permanent tooth germs. The disadvantage of marsupialization is the pathologic tissue left in situ. Ameloblastoma, squamous cell carcinoma, or intraosseous mucoepidermoid carcinoma may develop from the cells in the lining of a dentigerous cyst; however, recurrence of dentigerous cyst is seldom found, especially after complete removal of cyst or tooth eruption. **(Hu YH et al., 2011)**



Fig 2 : Marsupialization of the cystic cavity on the vestibular area of the alveolar bone. Maintenance of the aperture using a silicone tube

### **2.1.3 Decompression**

Decompression as initial procedure is a common conservative approach requiring preparation and preservation of a cyst opening. The aim is to decrease intracystic pressure by constant drainage, so allowing new centripetal bone growth from the bony cyst walls. **(Schlieve T et al.,2014)** The cyst opening can be preserved with simple iodoform gauze packing, a custom-made obturator, bracket and chain on involved impacted teeth, and drains. **(Carter LM et al.,2007)**

The main advantages of decompression are that it spares tissue, minimizes the likelihood of damage to adjacent structures, and avoids the cost of hospitalization. **(Maurette PE et al.,2006)** Disadvantages of decompression include the duration of treatment, discomfort, and reliance on patient compliance. Further, remnants of the epithelial lining can lead to cyst recurrence requiring further surgical treatment. **(Habibi A et al.,2007)**

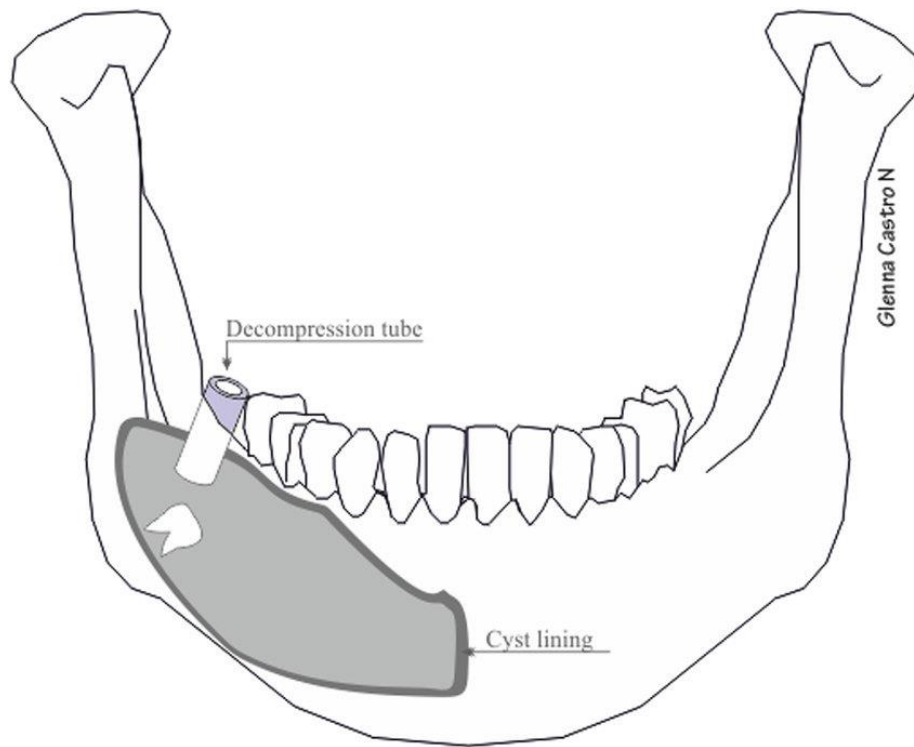


Fig 3: Decompression to the mouth.

Marsupialization and decompression are similar procedures in which a surgical window is created and maintained to allow for evacuation of cystic content over time. Marsupialization maintains an open cavity by securing the everted cystic lining to the surrounding mucosa using sutures, whereas decompression often refers to the placement of some type of drain or prosthesis to ensure patency.

Both techniques are utilized to decrease the size of the lesion, allowing for decreased morbidity at the time of definitive treatment.

### **3.1 Classification of Odontogenic Cysts**

Inflammatory odontogenic cysts are classified as: (Shear et al., 2007)

- Periapical cyst
- Residual cyst
- Paradental cyst

Developmental odontogenic cysts are classified as :

- Eruption cyst
- Lateral periodontal cyst
- Gingival cyst
- Odontogenic keratocyst (OKC)
- Glandular odontogenic cyst
- Calcifying odontogenic cyst
- Dentigerous cyst
- Gingival cyst of newborn



## 3.2 Periapical Cyst

Commonly known as a dental cyst, the periapical cyst is the most common odontogenic cyst. It may develop rapidly from a periapical granuloma, Periapical is defined as "the tissues surrounding the apex of the root of a tooth" and a cyst is "a pathological cavity lined by epithelium, having fluid or gaseous content that is not created by the accumulation of pus." (Scholl et al., 1999)

Most frequently located in the maxillary anterior region, the cyst is caused by pulpal necrosis secondary to dental caries or trauma. Its lining is derived from the epithelial cell rests of Malassez which proliferate to form the cyst. Such cysts are very common. Although initially asymptomatic, they are clinically significant because secondary infection can cause pain and damage. (Dunfee et al., 2006)



Fig 4: Visual image of periapical cyst Swelling can be observed in the right cheek.

Circular or ovoid radiolucency surrounding the root tip of approximately 1-1.5 cm in diameter is indicative of the presence of a periapical cyst. (Scholl et al., 1999) The border of the cyst is seen as a narrow opaque margin contiguous with the lamina dura.



Fig 5: Radicular (periapical) cyst

### 3.2.1 Management

The infected tissue of the periapical cyst must be entirely removed, including the epithelium of the cyst wall; otherwise, a relapse is likely to occur. Root canal treatment should be performed on the tooth if it is determined that previous therapy was unsuccessful. Removal of the necrotic pulp and the inflamed tissue as well as proper sealing of the canals and an appropriately fitting crown will allow the tooth to heal under uninfected conditions. (Scholl et al., 1999)

Surgical options for previously treated teeth that would not benefit from root canal therapy include cystectomy and cystostomy. This route of treatment is recommended upon discovery of the cyst after inadequate root canal treatment. A cystectomy is the removal of a cyst followed by mucosa and wound closure

to reduce chances of cyst regeneration. This type of treatment is more ideal for small cysts. A cystostomy is recommended for larger cysts that compromise important adjacent anatomy. The cyst is tamponaded to allow for the cyst contents to escape the bone. Over time, the cyst decreases in size and bone regenerates in the cavity space.

Marsupialization could also be performed, which involves suturing the edges of the gingiva surrounding the cyst to remain open. The cyst then drains its contents and heal without being prematurely closed. The end result is the same as the cystostomy, bone regeneration. For both a cystostomy and marsupialization, root resectioning may also be required in cases where root resorption has occurred. (**Kirtaniya BC et al., 2010**)

### **3.3 Residual Cyst**

Residual cysts are inflammatory cysts that are usually periapical in position and persist after the removal of associated tooth. They represent approximately 10% of all odontogenic cysts and are usually asymptomatic. (**Main DM. 1990**)

Intrinsic calcifications present in the odontogenic cysts were first reported by **Lovestadt and Bruce** and later by **Browne et al.,** . Calcifications in the residual cysts are quiet rare. However, **Shafer et al.,** stated that the term, ‘residual cyst’ could be used for any cyst of the jaw, that remained following surgery.

According to previous reports (**Cabrini RL et al., 2003**) majority of the residual cysts are asymptomatic, they occur in the alveolar process and body of the jaw bones in edentulous areas, but may also be found in the lower ramus in patients who are over the age of twenty years, with the average age at the time of presentation being 52 years. Males are affected slightly more commonly than

females, with a ratio of 3:2 and maxilla is more commonly involved than the mandible.

Radiographically, residual cyst appears as well-defined radiolucency, with a distinct sclerotic margin in edentulous area. The sclerotic margin may be fine, thin and it may be thicker and diffusely sclerotic. (White SC, Pharoah MJ. 2006)

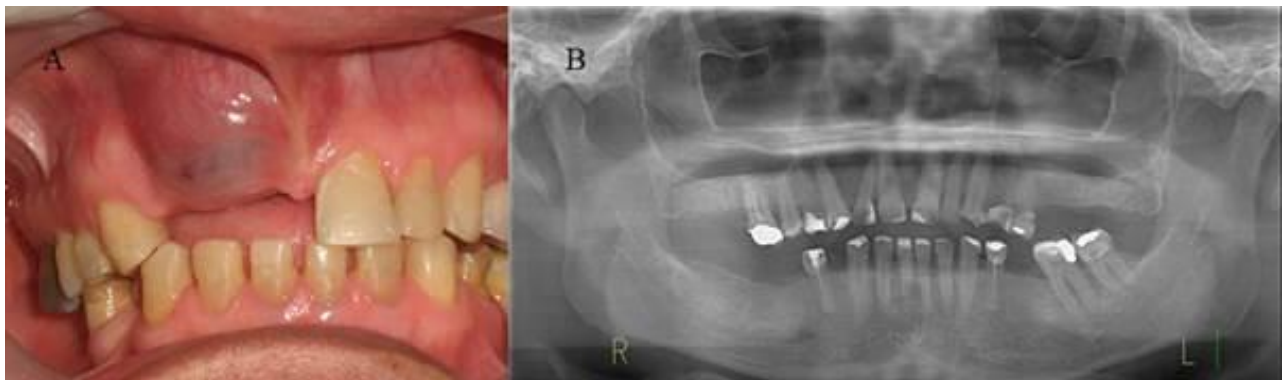


Fig 6: A) Clinically, there is an increased bulk in the edentulous area at the level of 11 and 12, with a healthy, translucent, bluish mucous lining. B) Initial panoramic radiograph showing a well-circumscribed radiolucent image with no defined margins located between dental organs 12 and 13.

### 3.3.1 Management

The treatment of choice for residual cysts is surgical enucleation, along with removal of the lining of the cyst. The rate of recurrence is low. However, a regular follow up is needed, to rule out malignant transformation and recurrence.

### 3.4 Gingival cysts of newborn

Epstein pearls, Bohn nodules, and gingival cyst of the newborn (dental lamina cyst) are peculiarly similar lesions that have been confused and interchanged throughout the years. They have a similar clinical appearance, same histology, and natural history of evolution but differ in etiology.

They arise from the rests of the dental lamina. **(Singh RK et al., 2012)**

Gingival cysts of the newborn appear as small 2 to 3 mm in diameter, isolated or multiple whitish papules on the crest of the alveolar ridge of newborns. **(Singh RK et al., 2012)** They are more commonly found in the maxilla than the mandible and have the same histological appearance as palatal cysts.



Fig 7: Gingival cyst of newborn ((Courtesy of the Department of Oral Medicine and Oral Pathology, University of Copenhagen.)

### **3.4.1 Management**

gingival cysts of the newborn are diagnosed based on their clinical features alone. No laboratory or imaging is required as they do not involve bone. **(Singh RK et al., 2012)**

No treatment or removal is required as they spontaneously regress within a few weeks or months. **(Lewis DM , 2010)** They are seldom observed after three months of age. Parental apprehension should be alleviated by reassurance and follow-up appointments.

## **3.5 Odontogenic Keratocyst**

An odontogenic keratocyst is a rare and benign but locally aggressive developmental cyst. It most often affects the posterior mandible and most commonly presents in the third decade of life. **(MacDonald-Jankowski DS January 2011)** Odontogenic keratocysts make up around 19% of jaw cysts. **(Crispian S 2008)**

Odontogenic keratocysts can occur at any age, however they are more common in the third to sixth decades. The male to female ratio is approximately 2:1. The majority are found in the mandible, with half occurring at the angle of the mandible.

Early odontogenic keratocysts usually do not display symptoms. Typically, clinical signs and symptoms present with bony expansion, or infection.

When symptoms are present they usually take the form of pain, swelling and discharge due to secondary infection. Odontogenic keratocysts are usually noted as incidental radiographic findings. Radiographically they can be seen as unilocular or multilocular radiolucencies. They can be mistaken for other cysts

such as residual cysts or a dentigerous cyst if they occur over an unerupted tooth. **(Sharif FN et al., 2015)**



Fig 8: Classic look to a keratocystic odontogenic tumor in the right mandible in the place of a former wisdom tooth. (Coronation Dental Specialty Group 2013)

### **3.5.1 Management**

As the condition is quite rare, opinions among experts about how to treat OKCs differ. A 2015 Cochrane review found that there is currently no high quality evidence to suggest the effectiveness of specific treatments for the treatment of odontogenic keratocysts. **(Sharif FN et al., 2015)**

Treatment depends on extent of multilocularity and cyst. Small multilocular and unilocular cysts can be treated more conservatively through enucleation and curettage. Treatment options for OKC may vary according to its size, extent, site, and adjacent structures.

Treatment options: **(Madras J, Lapointe H March 2008)**

- Surgical enucleation: surgical removal of the entire epithelial lining of the cyst.
- Marsupialisation followed by enucleation: this method is carried out by surgeons for larger cysts.
- Curettage involving simple excision and scraping-out of cavity.
- Carnoy's solution fixative (ethanol, chloroform and acetic acid) which is usually used in conjunction with excision and curettage. Cavity wall can be treated with the fixative either before enucleation to kill the lining of the wall or added after curettage to bony walls, killing any residual epithelial cells to a depth of 1-2mm. Used with care near mandibular canal and the neurovascular bundle within.
- Marsupialization which involves the surgical opening of the cyst cavity and a creation of a marsupial-like pouch. This allows the cavity to be in contact with the outside of the cyst for an extended period of time. Marsupialisation results in slow shrinkage of the cyst allowing later enucleation. However, resolution can take up to 20 months and patients are required to clean the open cavity and irrigate it.
- Peripheral ostectomy after curettage and/or enucleation. Extensive cysts may require a bone graft after bone resection and reconstruction of the area.
- Simple excision
- Enucleation and cryotherapy. (**Schmidt BL, Pogrel MA July 2001**)  
Decompression followed by enucleation has been shown to be most successful with lowest recurrence rates. (**de Castro MS et al., 2018**)
- Topical application of 5FU after enucleation. (**Ledderhof NJ et al., 2017**)
- Ostectomy or En – bloc resection: in addition to the above treatments, these may be required due to the issue of recurrence. Ostectomy is removal of peripheral bone. En – block resection is removal of the cyst



with the surrounding tissue. Extensive cysts may require a bone graft after bone resection and reconstruction of the area.

Annual radiographic review has been recommended. **(Coulthard P et al., 2013)**

Malignant transformation to squamous cell carcinoma may occur, but is unusual. **(Piloni MJ et al., 2015)**

### **3.6 Dentigerous cyst**

A dentigerous cyst is one that encloses the crown of an unerupted tooth by expansion of its follicle, and is attached to its neck.

Dentigerous cysts are the second most prevalent type of odontogenic cysts after radicular cyst. Seventy percent of the cases occur in the mandible. Dentigerous cysts are usually painless. The patient usually comes with a concern of delayed tooth eruption or facial swelling. A dentigerous cyst can go unnoticed and may be discovered coincidentally on a regular radiographic examination **(Motamedi, M. H. K.; Talesh, K. T. 2005)**

Classic symptoms of sinus disease such as headache, facial pain, purulent nasal discharge or nasolacrimal obstruction may occur when maxillary sinus is involved. **(AlKhudair et al., 2019)**

Dentigerous cysts most commonly occur in the 2nd and 3rd decades of life. **(Zhang, L. L et al., 2010)**

As the epithelial lining is derived from the reduced enamel epithelium, on radiographic examination, a dentigerous cyst appears as a unilocular radiolucent area that is associated with just the crown of an unerupted tooth and is attached to the tooth at the cemento-enamel junction. **(Douglas R., Gnepp 2009)**

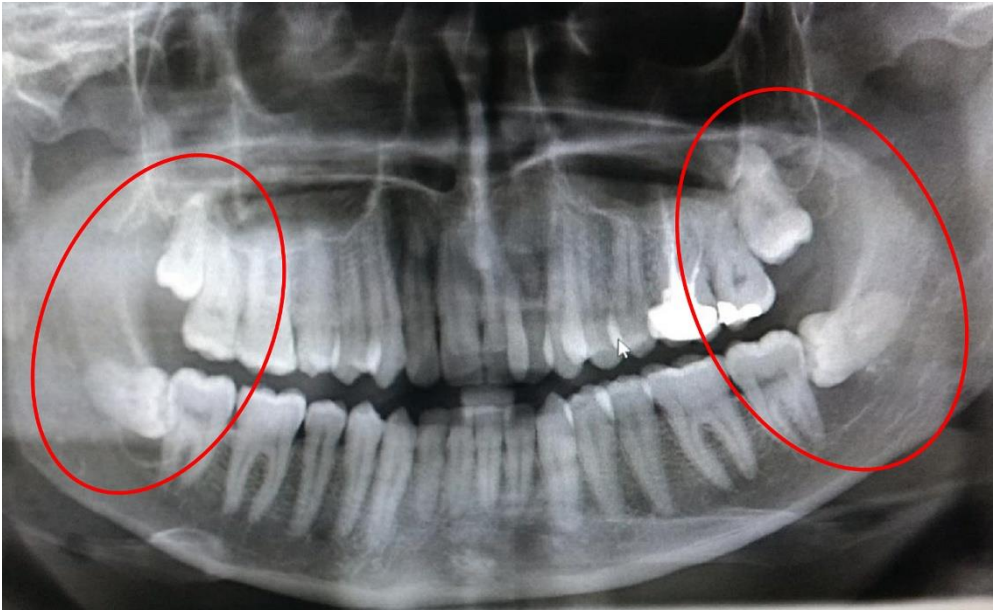


Fig 9: Panoramic radiograph showing radiolucencies compatible with dentigerous cysts, associated with both horizontally impacted mandibular third molars (red circles)

### **3.6.1 Management**

The treatment of choice for dentigerous cyst is enucleation along with extraction of the impacted teeth. If eruption of the unerupted tooth is considered feasible, the tooth may be left in place after partial removal of the cyst wall. Orthodontic treatment may subsequently be required to assist eruption. Similarly, if displacement of the associated tooth by the cyst has occurred and extraction may prove to be difficult, orthodontic movement of the tooth to a more advantageous location for extraction may be accomplished. Marsupialization may also be used to treat large dentigerous cysts. This permits the decompression of the cyst, with a resulting decrease in the size of the bone defect. The cyst can then be excised at a later date, with a less extensive surgical procedure. **(Neville. et al., 2015)**

The prognosis for the dentigerous cyst is excellent, and recurrence is rare. **(Neville et al., 2015)**

### 3.7 Eruption cyst

The eruption cyst is a form of soft tissue benign cyst accompanying with an erupting primary or permanent teeth and appears shortly before appearance of these teeth in the oral cavity. It is a soft tissue analogue of the dentigerous cyst, but recognized as a separate clinical entity. **(Anderson RA. 1990)**

Dentigerous cyst develops around the crown of an unerupted tooth lying in the bone, the eruption cyst occurs when a tooth is impeded in its eruption within the soft tissues overlying the bone. **(Neville BW et al., 2009)**



Fig 10: Eruption cysts involving the maxillary permanent incisors.

Although there are a number of theories about their origin, both seem to arise from the separation of the epithelium from the enamel of the crown of the tooth due to an accumulation of fluid or blood in a dilated follicular space. **(Boj JR, Gracia-Godoy F. 2000)**

Eruption cyst and hematoma usually present in first and second decades. **(Pinkham JR et al., 2005)** Reports show that most eruption cysts occur in an age range of 6–9 years, a period coinciding with the eruption of permanent first molars and incisors. **(Aguilo L et al., 1998)**

Clinically, the lesion appears as a circumscribed, fluctuant, often translucent swelling of the alveolar ridge over the site of the erupting tooth. When the circumcoronal cystic cavity contains blood, the swelling appears purple or deep blue; hence, the term “eruption haematoma”. **(Mc Donald RE et al., 2004)**

On radiographic examination, it is difficult to distinguish the cystic space of eruption cyst because both the cyst and tooth are directly in the soft tissue of the alveolar crest and no bone involvement is seen in contrast to dentigerous cyst in which a well-defined unilocular radiolucent area is observed in the form of a half moon on the crown of a non-erupted tooth. **(Anderson RA. 1990)**



Fig 11: Periapical radiograph showing erupting 11. Cystic cavity not visible

### 3.7.1 Management

Mostly, the eruption cysts do not require treatment and majority of them disappear on their own. Surgical intervention is required when they hurt, bleed, are infected, or esthetic problems arise. Treatment has to be performed in order for the child to lead a healthy and comfortable life. The relatively high rate of such cysts and the fact that they occur in an area of rapid developmental change suggests the need for a conservative management in the young patient population. Interventional treatment may not be necessary because the cyst ruptures spontaneously, thus permitting the tooth to erupt. If this does not occur, simple excision of the roof of the cyst generally permits speedy eruption of the tooth. 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. **(Eversole LR. 1984)** A novel treatment modality has been suggested by **Boj *et al.***, which consists of use of Er, Cr-YSGG laser for treatment of eruption cysts. It has certain advantages over conventional lancing with scalpel. They can be listed as non-requirement of anesthesia, no excessive operative bleeding, does not produce heat or friction and patient will be comfortable. It is bactericidal and has coagulative effects, tissue healing is better and faster, and it is not associated with postoperative pain. **(Boj JR et al., 2006).**



Fig 12: Exposure of 11 crown

### 3.8 Gingival cyst of adults

Gingival cyst of adults (GCAs) is a rare, noninflammatory, developmental cyst derived from the rests of dental lamina. **(Kelsey WP et al., 2009)**

The gingival cyst of the adult (GCA) is considered a variation or counterpart to the lateral periodontal cyst. GCAs are developmental and noninflammatory, as well as rather uncommon with reports ranging from 0.5 to 1% of reported odontogenic cysts.

The lesion is usually less than 1.0 cm in diameter, The favored location is the mandibular canine-premolar region. **(Wysocki et al. 1980).**

The gingival cyst appears as a nodule that is painless, smooth, nonblanching, and may be normal in color. The area is usually nonmobile, flesh-colored with a light blue hue in some cases, and a firm nodule that may be slightly depressed with pressure.



Fig 13: Clinical photo of GCA in the attached gingiva with translucent bluish hue.

The GCA will usually not appear radiographically distinct unless the cyst is large and emits pressure on the bone, creating resorption leading to a depression.



Fig 14: Radiograph of a gingival cyst in an adult. There is a faint radiographic shadow (marked with arrows) indicative of superficial bone erosion.

### 3.8.1 Management

The gingival cyst is removed by local surgical excision and in the majority of cases there is no tendency for recurrence . However, caution must be observed if the pathologist reports a multicystic or botryoid variety of cyst. This may signal that one is dealing with a lateral periodontal rather than an adult gingival cyst. This is referred to again later in this chapter.



Fig 15: Clinical view of surgical treatment. (a) Local anesthesia administered; (b) Incision made by #11 blade; (c) Postoperative view; (d) Periodontal pack placed

After the lesion was removed a (3 mm × 3 mm) defect in the attached gingiva was appreciated. On careful examination, it was verified underlying bone was not exposed. The area was irrigated with betadine and sterile saline. A periodontal pack was placed, postoperative instructions were given, and the patient was dismissed. The patient was prescribed 0.2% chlorhexidine gluconate two times per day for 2 weeks. The patient was recalled after 1 week.

**(J Indian Soc Periodontol. 2018)**



### 3.9 Lateral Periodontal Cyst

“Lateral periodontal cysts (LPCs) are defined as non-keratinised and non-inflammatory developmental cysts located adjacent or lateral to the root of a vital tooth.” **(Chrcanovic BR, Gomez RS January 2019)** LPCs are a rare form of jaw cysts, with the same histopathological characteristics as gingival cysts of adults (GCA).

Observable clinical signs of a LPC include a small, soft-tissue swelling found just below or within the interdental papilla. However, as it is usually asymptomatic in nature, LPCs are usually detected through radiography. **(Siponen M et al., 2011)**

On radiographs, the LPC appears with a well-defined round, oval or sometimes tear-drop shape. It also has an opaque outline along the edge of the tooth root. In rare situations, possible implications include loss of enamel and dentine of adjacent teeth, loss of lamina dura and enlargement of the periodontal ligament space. **(Chrcanovic BR, Gomez RS January 2019)**

Lateral periodontal cysts can be classified into two morphological types: Unicystic and Multicystic. **(Van der Waal I 1992)**

Under the microscope, the LPC is seen as a cystic cavity with a thin layer of epithelium along its margin and held up by a connective tissue. **(Siponen M et al., 2011)**



Fig 16: Preoperative clinical photograph and radiographs showing circumscribed swelling in the attached gingiva in between the left mandibular canine (33) and premolar (34)

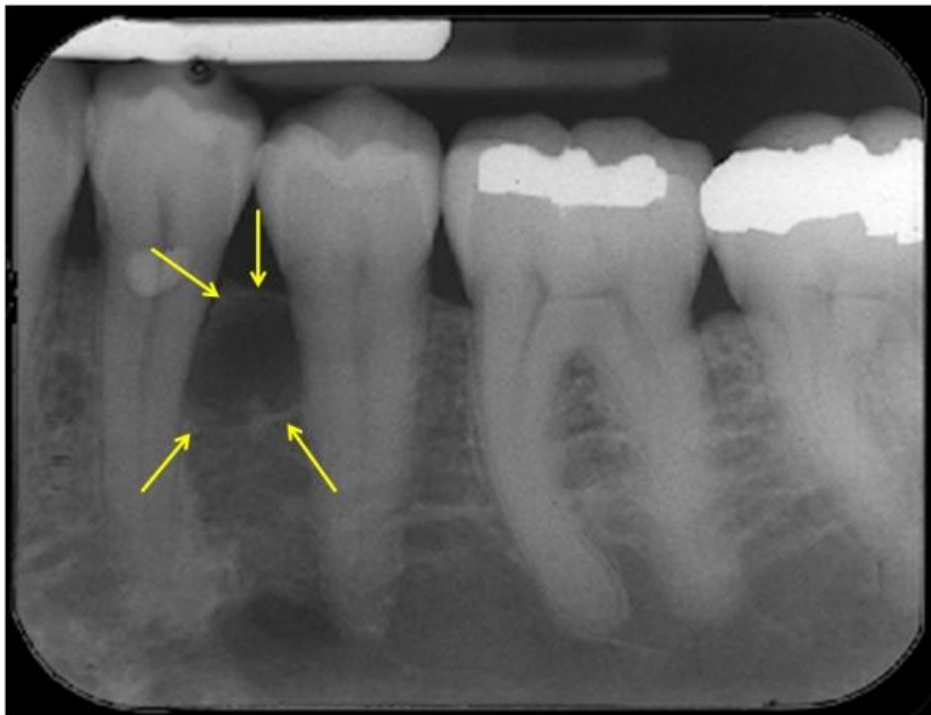


Fig 17: Lateral periodontal cyst – mandible

### **3.9.1 Management**

Successful treatment of LPC consists of surgical removal of the lesion by conservative enucleation with guided bone regeneration technique (GBR) with xenograft and resorbable collagen membrane. This is often achieved without affecting the periodontal health of adjacent teeth. Periodic radiographic follow-up monitoring of the patient for any recurrence is also recommended. **(Ramalingam S et al.,2019)** Typically, bone regeneration of the bony defect is achieved within 6–12 months, by placing an osteoconductive bone substitute material into the defect and covering it with a barrier membrane (such as a resorbable collagen barrier membrane (RCM)). **(Ramalingam S et al.,2019)** The reported recurrence rate remains very low. LPC is usually reported as a coincidental finding during routine radiograph analysis, and usually does not show any symptoms due to its non-inflammatory nature, unless the cystic lesion is subject to secondary infection. **(de Carvalho LF et al., 2010)**

### **3.10 Botryoid Odontogenic Cyst**

BOC is an unusual and controversial pathology. By definition, LPC is a non-keratinized development cyst occurring in the alveolar bone along the lateral aspect of a vital tooth . **(Regezi JA et al., 2012)** The so-called BOC could be defined as a "multilocular variant of LPC" . **(Regezi JA et al., 2012)**

other authors . **(Van der Waal I,1992)** do not consider LPC and BOC the same entity, and define BOC as a "multicystic odontogenic lesion with histological characteristics of lateral periodontal cyst", or "cystic lesion similar to lateral periodontal cyst". Otherwise, High et al. **(High As et al.,1996)** , proposed the

term "polymorphic odontogenic cyst". This term may include BOC and other lesions as glandular odontogenic cyst.

LPCs are usually asymptomatic (Carter LC et al.,1996)



Fig 18: Photograph of swelling on left mandible in canine-premolar area (a) intraoral view of the swelling (b) pre-operative panoramic view showing a unilocular radiolucent lesion between roots of left mandibular canine and first premolar. Displacement of lateral incisor, canine and both premolars can be seen (Contemp Clin Dent. 2012)

BOCs represent an unusual pathology, in relation to vital teeth of mandibular canine-premolar area. Size and multilocular patterns could be the main factors associated to recurrence. High recurrence rate detected in this review. (**Carter LC et al.,1996**)

### **3.10.1 Management**

Careful surgical excision is the treatment of choice for BOC and conservative enucleation is contraindicated as the recurrence rate in BOC is around 34% (**Méndez P et al., 2007**), which is due to the difficulty in removing or failure to remove the entire multilocular lesion during surgery. The long term follow-up is mandatory because of high recurrence rate (**Mori K et al., 2011**) Pathological categorization of a lesion as BOC is important mainly with regard to the treatment aspect and the follow-up period.

## **3.11 Glandular Odontogenic Cyst**

A glandular odontogenic cyst (GOC) is a rare and usually benign odontogenic cyst developed at the odontogenic epithelium of the mandible or maxilla. (**Faisal et al., 2015**) (**Prabhu et al., 2010**) Originally, the cyst was labeled as "sialo-odontogenic cyst" in 1987. (**Shear et al., 2007**) only 60 medically documented cases were present in the population by 2003. (**Kaplan et al., 2005**)

The GOC development is more common in adults in their fifth and sixth decades. (**Borges et al., 2012**)

The appearance of a protrusive growth will be present at their mandible or maxilla. (**Faisal et al., 2015**) The expansive nature of this cyst may destruct the quality of symmetry at the facial region and would be a clear physical sign of

abnormality. A painful and swollen sensation at the jaw region caused by GOC may be reported. Detailing of a painless feeling or facial paraesthesia can be experienced. (Neville, Brad W. 2016) GOC is filled with cystic a fluid that differs in viscosity and may appear as transparent, brownish-red, or creamy in colour. (Momeni Roochi et al., 2015)

Radiographic imaging of the GOC can display a defined unilocular or multilocular appearance that may be "rounded or oval" shaped upon clinical observation. The margin surrounding the GOC is usually occupied with a scalloped definition. (Faisal et al., 2015) The GOC has an average size of 4.9 cm that can develop over the midline when positioned at the mandible or maxilla region. (Neville, Brad W. 2016)

The GOC usually features a "stratified squamous epithelium" attached to connective tissue that is filled with active immune cells. The lining of the epithelium features a very small diameter that is usually non-keratinised. (Akkaş et al., 2015)



Fig 19: Glandular odontogenic cyst



Fig 20: Radiography shows a well-defined, unilocular lesion extending in the anterior body of the left mandible.

### 3.11.1 Management

The unilocular and multilocular nature is imperative to the determination of treatment style. Local anesthesia is regularly provided as the GOC is embedded within the tissue structure of the jaw and requires an invasive procedure for a safe and accurate extraction. (Faisal et al., 2015) For unilocular GOCs with minimal tissue deterioration, **"enucleation, curettage, and marsupialization"** is a suitable treatment plan. Notably, the performance of enucleation or curettage as the primary action is linked to an incomplete extraction of the GOC and is only recommended to the less invasive lesions. Multilocular GOCs require a more invasive procedure such as **"peripheral ostectomy, marginal resection, or partial jaw resection"**. (Kaplan et al., 2005) GOCs associated with a more severe structural damage are encouraged to undergo marsupialization as either an initial or supplementary surgery.

Alongside the main treatments, bone allograft application, cryosurgery, and apicoectomy are available but have not been consistently recommended. **(Akkaş et al., 2015)** Though Carnoy's solution, the chloroform-free version, is recommended with the treatment as it degenerates the majority of the damaged dental lamina. The most effective type of treatment remains unknown due to the lack of detailed data from reported cases. **(Momeni Roochi et al., 2015)**

### **3.12 Calcifying Odontogenic Cyst**

Calcifying odontogenic cyst (COC) is a rare developmental lesion that comes from odontogenic epithelium. **(Zornosa et al., 2010)** It is also known as a calcifying cystic odontogenic tumor, which is a proliferation of odontogenic epithelium and scattered nest of ghost cells and calcifications that may form the lining of a cyst, or present as a solid mass. **(Gamoh et al., 2017)**

Most calcifying odontogenic cysts appear asymptomatic. They are normally presented as a painless, slow-growing mass on the mandible and/or the maxilla, mostly in the front of the mouth. Symptoms include swelling in the mouth, both inside the bone, in the tooth bearing areas, and outside the bone, in the gingiva. When a COC is located in the maxilla, individuals might complain of nasal stiffness, epistaxis, and headache.

The diameter of the cyst ranges from 2 to 4 cm and swelling pain may be present. **(Regezi JA et al., 2012)**

These calcifying odontogenic cysts are usually discovered using dental radiographs. They will appear as unilocular (one chamber), multilocular (multiple chambers) or mixed radiolucencies with some radiopaque deposits of differing sizes and opacities. Irregular calcifications may be seen in some cases. They are often located in a periapical or lateral periodontal relationship to adjacent teeth. **(Zornosa et al., 2010)**



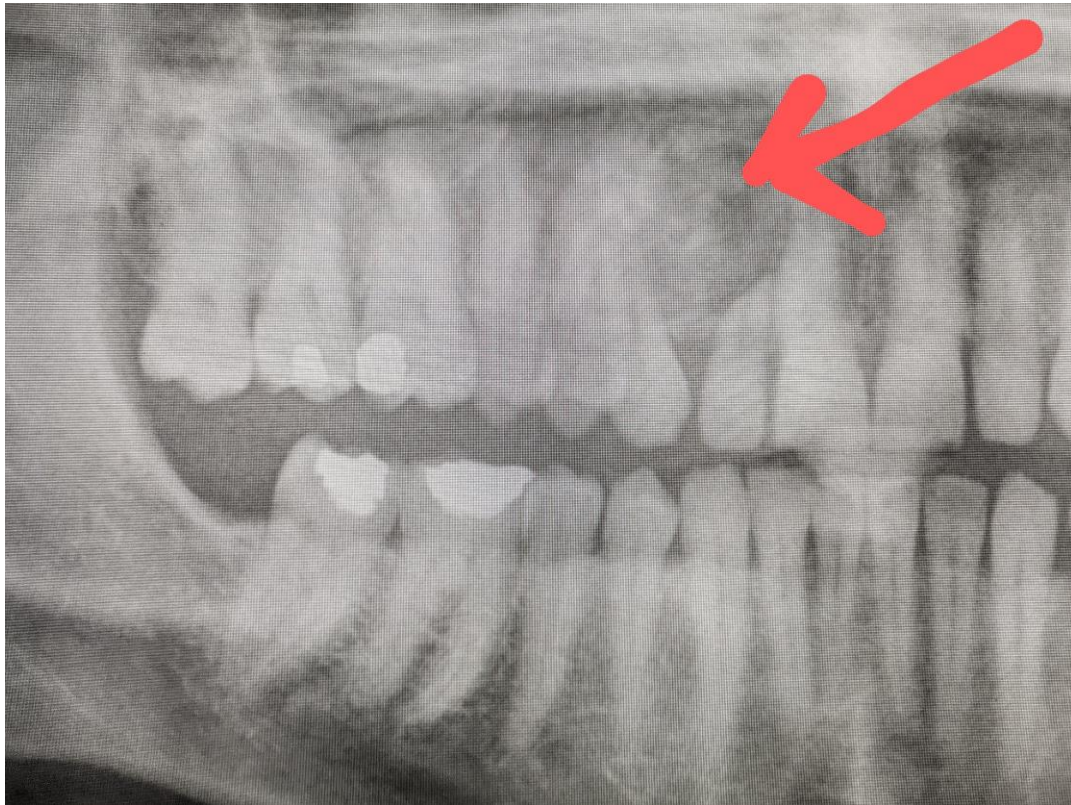


Fig 21: Calcifying Odontogenic Cyst involving the left anterior maxilla

### 3.12.1 Management

The standard treatment of calcifying odontogenic cyst is enucleation and curettage, however it depends on the lesion site and histological pattern. Enucleation followed by the removal of 1 to 2 millimeters layer of bone around the edges of the cystic cavity with a sharp curette or bone bur. The point of this procedure is to remove the epithelial debris that could cause recurrent lesions. Recurrence following enucleation and curretage is rare. (**Mervyn Shear; Paul Speight 2008**)

Once treatment is complete, follow-up visits may be required to monitor recurrence of the cyst.

The prognosis of a calcifying odontogenic cyst is favorable. It has minimal chance of recurrence after simple surgical removal. **(Zornosa et al., 2010)** There have only been a small number of recurrences reported after enucleation.

## **4.1 Complications :**

Complications associated with odontogenic cysts are also contingent on the precise type of cyst:

- Periapical cysts do not typically present with complications after excision. A residual cyst may form due to incomplete curettage during extraction and a periapical scar may develop when a lesion fills with collagenous tissue rather than bone. **(Molven O et al., 1996)**
- Residual cysts can cause bone destruction if left untreated, which puts the adjacent teeth at risk. In general, these cysts do not present with complications once removed and have a low to no recurrence after excision.
- Paradental cysts are associated with pericoronitis, which is a deep periodontal pocket. This may damage to the local periodontium as a consequence of the follicular expansion. Typically, they do not present with complications once removed and they do not recur after excision. **(Ackermann G et al., 1987)**
- Dentigerous cysts are associated with bony destruction due to the expansion of the cyst. Typically do not present with complications once removed and there is low to no recurrence after excision. **(Daley TD et al., 1996)**
- Eruption cysts are often self-limiting and present without complications. **(Dhawan P et al., 2012)**
- Lateral periodontal cysts typically do not present with complications once removed and they do not recur after excision.

- Odontogenic keratocysts have a high recurrence rate; therefore, close follow-up is necessary. If recurrence occurs, the patient will require additional surgical treatment.
- Glandular odontogenic cysts have a high recurrence rate (20 to 30%); consequently, close interval and long-term follow-up is necessary. The potential for multiple recurrences is high. If there is a recurrence, the patient will require additional surgical treatment. **(Bilodeau EA et al., 2017)**

## 5.1 Conclusion

Enucleation of the cyst is considered the treatment of choice whenever possible. However, due to the degree of destruction generated by this technique, other more conservative options are proposed, such as marsupialization, decompression, endoscopy, cryotherapy, exodontia or a combination of treatments, aiming to preserve the anatomical structures adjacent to the lesion. However, the technique to be used will vary according to the characteristics of the lesion and the patient. Therefore, all variables should be well evaluated before choosing any treatment, seeking more safety and comfort to the patient.

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