Odontogenic Cysts: An Overview

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Abstract — The odontogenic cysts are pathologic cavities lined by epithelium and connective tissue fibers that arise from odontogenic tissues which are present in the tooth-bearing regions of the maxilla and mandible. In this article, we have discussed types of odontogenic cysts which are divided into developmental and inflammatory cysts. This activity reviews the most common odontogenic cysts, etiologies, clinical, radiological, and histopathology features, and management of a variety of odontogenic cysts. Almost all odontogenic cysts arise from the dental lamina and reduced enamel epithelium. The cyst of the jaws causes bony destruction and may cause resorption or displacement of adjacent teeth. Enucleation or marsupialization is usually done for the management of odontogenic cysts.

Index Terms — Odontogenic cyst, Dentigerous cyst, Odontogenic keratocyst, Lateral periodontal cyst, Calcifying odontogenic cyst, Radicular cyst.

I. INTRODUCTION

A cyst is a pathological, epithelium-lined cavity that contains fluid or semifluid material that often grows as a result of internal pressure caused by fluid sucked into the cavity via osmosis (hydrostatic pressure). Because of the abundance of epithelial remains in the jaws, the bones of the jaws, the mandible, and the maxilla, have the highest prevalence of cysts in the human body. Odontogenic cysts are cysts that arise from tissues that would normally develop into teeth. They are mostly asymptomatic and clinically it appears as bony hard swelling that increases in size. Odontogenic cysts are commonly treated by enucleation or marsupialization.

II. DEFINITION OF CYST

A cyst is defined as a pathological cavity having fluid, semi-fluid, or gaseous contents and which is not created by an accumulation of pus. -Kramer 1974.

III. CLASSIFICATION OF ODONTOGENIC CYSTS

It’s essential for the diagnosis and proper management. According to Shear, cysts are classified under three main headings:

1. Cysts of the jaws
2. Cysts associated with the maxillary antrum
3. Cysts of the soft tissues of the mouth, face, neck, and salivary glands.

1. Cysts of the jaws
   a. Epithelial-lined cysts
      i. Odontogenic
         a. Gingival cyst of infants
         b. Odontogenic keratocyst
         c. Dentigerous cyst
         d. Eruption cyst
         e. Gingival cyst of adults
         f. Developmental lateral periodontal cyst
         g. Botryoid odontogenic cyst
         h. Glandular odontogenic cyst
         i. Calcifying odontogenic cyst
      ii. Non-odontogenic
         a. Midpalatal raphé cyst of infants
         b. Nasopalatine duct cyst
         c. Nasolabial cyst
   b. Inflammatory origin
      i. Radicular cyst, apical and lateral
      ii. Residual cyst
      iii. Paradental cyst and juvenile paradental cyst
      iv. Inflammatory collateral cyst

B. Non-epithelial-lined cysts
   i. Solitary bone cyst
   ii. Aneurysmal bone cyst
2- Cysts associated with the maxillary antrum
   i. Mucocele
   ii. Retention cyst
   iii. Pseudocyst
   iv. Postoperative maxillary cyst

3- Cysts of the soft tissues of the mouth, face, neck, and salivary glands
   i. Dermoid and epidermoid cysts
   ii. Lymphoepithelial (branchial) cyst
   iii. Thyroglossal duct cyst
   iv. Anterior median lingual cyst (intralingual cyst of foregut origin)
   v. Oral cysts with gastric or intestinal epithelium (oral alimentary tract cyst)
   vi. Cystic hygroma
   vii. Nasopharyngeal cyst
   viii. Thymic cyst
   ix. Cysts of the salivary glands: mucous extravasation cyst; mucous retention cyst; ranula; polycystic (dysgenetic) disease of the parotid
   x. Parasitic cysts: hydatid cyst; Cysticercus cellulosae; trichinosis

Shafer’s Classification for odontogenic cyst:

- Classification based on etiology:
  a. Developmental – Unknown origin but are not the result of an inflammatory reaction
    i. Dentigerous cyst
    ii. Eruption cyst
    iii. Odontogenic keratocyst
    iv. Gingival (alveolar) cyst of newborn
    v. Gingival cyst of adult
    vi. Lateral Periodontal cyst
    vii. Calcifying odontogenic cyst
    viii. Glandular odontogenic cyst.
  b. Inflammatory -
    i. Periapical
    ii. Residual periapical (radicular) cyst
    iii. Paradental cyst

- Classification by tissue of origin:
  a. Derived from rests of Malassez –
    i. Periapical cyst
    ii. Residual cyst
    iii. Derived from reduced enamel epithelial
    iv. Dentigerous cyst
    v. Eruption cyst
  b. Derived from dental lamina - (rest of Serres)
    i. Odontogenic keratocyst
    ii. Gingival (alveolar) cyst of newborn
    iii. Gingival cyst of adult
    iv. Lateral Periodontal cyst
    v. Calcifying odontogenic cyst
    vi. Glandular odontogenic cyst

IV. DENTIGEROUS CYST (DC) (FOLLICULAR CYST)

Cysts that enclose the crown of an unerupted tooth by an expansion of its follicle. They arise due to fluid accumulation between the enamel of the tooth and reduced enamel epithelium. These cysts are attached at the amelo-cemental junction of the tooth. Males are more commonly affected. They are commonly seen in the third decade of life.

Clinically, DC is mostly associated with impacted teeth, like mandibular third molar and maxillary canine teeth. They cause the resorption of roots of the adjacent teeth.

Radiographically, DC are classified into three types: Central type- when radiolucency surrounds the crown of an unerupted tooth; Lateral type – that encloses laterally along the tooth; Circumferential type - where the crown and the root of the tooth are encircled. These cysts are well-circumscribed, unilocular radiolucencies along with well-defined sclerotic margins associated with the crown of an unerupted tooth.

Histologically, there is a presence of a thin layer of epithelial lining which is of 2–5 cells thickness, of non-keratinized stratified squamous or flattened epithelium which resembles the reduced enamel epithelium.

Treatment involves the removal of the involved tooth and the enucleation of the cyst lining. Marsupialization or enucleation of the cyst and leaving the tooth allows the tooth to erupt if the root formation of the involved tooth is incomplete.
V. ERUPTION CYST (ERUPTION HEMATOMA)

It is a cyst involving an unerupted tooth and is present within the soft tissues overlying an unerupted tooth. Children are most commonly affected than adults. This cyst involves deciduous and permanent teeth, mostly anterior to the first permanent molar.

Clinically, it presents as painless swelling which is soft and fluctuant and seen on the gingiva overlying the erupting tooth. This may appear in the same color as the gingiva or blue or purple in color.

Radiographically, it appears as a radiolucent lesion at the alveolar margin. No bony involvement is seen.

Histologically, the epithelial lining of the cyst consists of 1-5 cell layers of squamous epithelium resembling the reduced enamel epithelium. There is the presence of a glycogen-rich clear cell.

Management of the eruption cyst involves enucleation of the lesion. The tooth involved with the cyst may be retained/removed.

VI. ODONTOGENIC KERATOCYST (PRIMORDIAL CYST)

WHO changed the classification of odontogenic keratocyst to the keratocystic odontogenic tumor. They occur mostly in the 2nd and 3rd decades of life. It commonly occurs in males. 65-83% of the cysts involve the mandible and commonly occur at the angle of the mandible. The cysts develop from odontogenic epithelium from the dental lamina and its remnants and there is a role of the PTCH gene in the etiology of the cyst.

Clinically, they present as small swelling which can grow larger and are commonly found at the angle of the mandible. Paraesthesia may be present. Recurrence rates are 50–60%, including satellite cysts.

Radiographically, they present as small, round unilocular radiolucencies with scalloped margins. The lesions are well-demarcated with sclerotic margins. Multilocular lesions may also be present. There may be a cortical perforation. Multiple or solitary lesions may be present.

Histologically, the cyst is lined by stratified squamous keratinized epithelium with 5-8 cell layer thickness. There is an absence of rete ridges. The basal layer is intensely basophilic. Mitotic figures are found. Epithelial dysplasia may be seen. These can be unilocular, or multilocular.

Management of the cyst usually involves en-block resection. If the lesion is large, then bone resection and reconstruction using a composite-free graft are done.

VII. GINGIVAL CYST OF NEWBORN (DENTAL LAMINA CYST OR BOHN’S NODULES)

It is a true cyst which is an oral mucosal lesion of transient nature. The frequency of the cysts is higher in newborns and they are occasionally seen after 3 months of age. They are also known as the dental lamina cyst or Bohn's nodules.

Clinically, the cysts are multiple in number but rarely occur as solitary nodules. They are asymptomatic and do not cause discomfort for the infant. The cysts that are located at the mid-palatine raphe are referred to as palatine cysts and those present on the alveolar ridge are known as alveolar (or gingival) cysts. Palatally located cysts in newborns are known as Epstein’s pearls since they were first described by Alois Epstein.

Histologically, the cystic lining is composed of odontogenic epithelium and covered by a thick layer of keratin. Yellow color is seen due to the presence of keratin. It has a lumen filled with desquamated keratin and may have inflammatory cells.

Management of the cysts is that they break by themselves after a few days of birth through the discharge of keratin. They remain for a period of several months in some cases. In those cases, the surgical opening is done. Most of these cysts degenerate or rupture into the oral cavity at the time 2 weeks to 5 months of postnatal life.

VIII. LATERAL PERIODONTAL CYST (BOTRYOID ODONTOGENIC CYST)

The lateral periodontal cysts are developmental cysts that are non-keratinized and non-inflammatory and they are located adjacent to the root of the vital tooth. The lateral periodontal cyst is a non-inflammatory cyst derived from epithelial rests in the periodontal ligament.

It is an uncommon lesion found mostly in adults in the 5th to 7th decades and it is rare in young people under 30 years of age. The common site of occurrence is the mandibular premolar region. It does not have sex predilection.

Clinically, they present as mild swelling in the gingival area or on the alveolar mucosal area. A few infected cyst cases have also been reported due to the spread of infection by an accessory root canal in a non-vital tooth.

Radiographically, they appear as well-circumscribed radiolucency with a radiopaque margin between the roots of the canine and premolar. The defect appears as round or teardrop-shaped, well-circumscribed radiolucency. Most frequently the lateral periodontal cyst presents as a unilocular radiolucency.

Histologically, cyst lining is characterized by thin cuboidal to the stratified squamous non-keratinized epithelium. The epithelial plaques or the superficial layer of the lining epithelium consist of glycogen-rich clear cells.

Treatment involves enucleation. The graft & Guided Tissue Regeneration membrane have been placed.

IX. CALCIFYING ODONTOGENIC CYST (COC) (CALCIFYING CYSTIC ODONTOGENIC TUMOR, GORLIN CYST)

COC is a rare developmental odontogenic lesion and usually, it exists in two variants; cystic or solid. It arises from odontogenic epithelial remnants within the maxilla and mandible and is associated with impacted teeth.

Clinically, swelling is present with or without pain. Intraosseous lesions may produce a hard bony expansion and it is extensive and may displace the teeth. Rarely lingual expansion is seen. The extraosseous lesions vary in color from pink to red.

Radiographically, the intraosseous lesions appear as a radiolucent area. In some cases, well-demarcated margins are present. Mostly they are unilocular, with irregular calcified bodies and opacity are seen. Superficial bone resorption or saucer-shaped radioluencies are seen in the extraosseous lesions.
Histologically, there is the presence of a basal layer that has palisaded columnar or cuboidal cells and hyperchromatic nuclei. The epithelium lining has a 6-8 cell thickness and may have melanin deposits. Satellite cysts may be present. Ghost cells are the characteristic features of COC.

Management involves enucleation or curettage 6.

X. GLANDULAR ODONTOGENIC CYST (SIALO-ODONTOGENIC CYST)
It is defined as a cyst arising in the tooth-bearing areas of the jaws. The cysts occur between the third and fifth decades of life.

Clinically, swelling is present. The glandular odontogenic cyst has two important attributes: it shows a high recurrence rate and an aggressive growth potential. Most of the cysts are present in the third molar region and commonly involve unerupted teeth.

Histologically, it has an epithelial lining with cuboidal or columnar cells. They are seen at the surface. The lining crypts or cyst-like spaces are present.

Radiologically, the cyst is multilocular and expansile in the anterior sextant.

Management of the cyst includes curettage and enucleation because the glandular odontogenic cysts are clinically aggressive with the potential for recurrence 7.

XI. PERIAPICAL CYST (RADICULAR CYST, APICAL PERIODONTAL CYST, ROOT END CYST, DENTAL CYST)
It is defined as a cyst that arises from epithelial remnants in the periodontal ligament due to inflammation, and the death of the dental pulp. They mostly involve apices of the permanent teeth and are also seen on the lateral aspect of roots.

Radicular cysts lead to bone resorption and may become symptomatic due to infection or compression of the nerve. The infection of the pulp also occurs due to the exposure of dentinal tubules at the cervical root surfaces.

Clinically, the radicular cysts are asymptomatic and they are discovered in teeth with non-vital pulp. In the maxilla, the buccal or palatal enlargement of swelling may be evident, and, in the mandible, there may be labial or buccal. Pain and infection may be present. They occur more commonly in the maxillary teeth than the mandibular teeth.

Radiographically, round or pear-shaped unilocular radiolucency is present in the periapical region.

Histologically, the cysts are lined by non-keratinized stratified squamous epithelium and of 6-8 cell layer thickness. The epithelial linings are proliferating and seen arcading. Polymorphonuclear leucocytes are seen in the inflammatory cell infiltrate.

Management includes conventional nonsurgical root canal therapy if the lesion is localized and surgical treatment like enucleation, marsupialization, or decompression if the lesion is large. Conservative treatment is done by endodontic technique 8.

XII. RESIDUAL PERIAPICAL CYST (RETAINED RADICULAR CYST)
The term referred to the retained radicular cyst from teeth which has been removed. The incomplete surgical removal of a radicular or other inflammatory cyst leads to the formation of a residual cyst.

Clinically, there may be pain and swelling present. Mostly the cysts are less than 1cm in size. The enlarging cysts may cause displacement of the adjacent teeth occasionally and also leads to expansion of the bone. They also lead to bone resorption.

Histologically, there is the presence of stratified squamous epithelial lining with 6-20 cell layers in an arcading pattern which may demonstrate exocytosis, spongiosis, or hyperplasia. Russell bodies are commonly seen. The inflammatory infiltrate is seen with foci of dystrophic calcifications and has numerous cholesterol clefts which have hemosiderin pigmentation.

Radiographically, the cysts show a round to oval radiolucency at the site of previous tooth extraction and also have dystrophic calcifications and radiographic opacities. There may be an expansion of the cortical bone.

Management involves surgical excision even if the lesion is asymptomatic. When both cortical plates are lost, there will be intraosseous fibrous scar formation. The treatment involves marsupialization or enucleation based on the size of the residual cyst 9.

XIII. PARADENTAL CYST (INFLAMMATORY COLLATERAL CYST)
It is defined as a cyst of uncertain origin that is found primarily on the distal aspect or facial aspect of a vital mandibular third molar, which consists of intensely inflamed connective tissue and epithelial lining. This is an inflammatory cyst that develops as a result of the unilateral expansion of the dental follicle secondary to the inflammatory destruction of the periodontium and alveolar bone which is localized mainly in the mandibular region.

It occurs in the lower first molar between 8 to 9 years and involves the second molar between 13 and 20 years of age with a Male: Female ratio is 2.4:1.14.

Clinically, they present as painful swelling with discomfort, and tenderness, and in a few cases, there is suppuration through the periodontal pocket. The important feature of a paradental cyst is a systematic inflammatory process presenting as pericoronitis. There may be vesicular swelling.

Radiographically, they present well-defined radiolucencies on the roots of the affected tooth, located mesially or distally to a partially erupted mandibular molar. There is also thinning of the inferior border of the mandibular cortex. The ‘Colgan’s sign’ is a useful diagnostic feature to differentiate a paradental cyst from a dentigerous cyst.

Histologically, there is the presence of fibrous connective tissue capsule with chronic inflammatory infiltrate, with hyperplastic, nonkeratinized, stratified squamous epithelium in an arcading pattern.

Management of paradental cysts includes enucleation of the cyst without removing the involved tooth in case of the 1st or 2nd molar. When a 3rd molar is involved, extraction of a tooth is done 10.
XIV. CONCLUSION

Odontogenic cysts represent a diverse group of pathologic lesions of the jaw. A physical examination along with imaging is the best initial tool for developing a differential diagnosis. The final diagnosis is made from the surgical pathology, and it dictates whether further treatment is required. Long-term follow-up is usually indicated after any surgical excision because of the high recurrence rates of many of the lesions. This article provides a brief overview of these and highlights the importance of identifying and managing these lesions appropriately.

REFERENCES