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PHARMACEUTICAL SCIENCES**<http://doi.org/10.5281/zenodo.1491790>Available online at: <http://www.iajps.com>*Review Article***ORAL CYSTS AETIOLOGY, CLASSIFICATION AND
TREATMENT***Running title: Oral Cysts***Abbas Al Mkenah ^{1*}, Seraj Al Baik ², Mohammed Al Helal ³, Fulwah Alsaleem ⁴, Abdullah Al Aethan ⁵, Muntasir Aynusah ⁶, Razan Alekhmimi ⁷, Ziyad Alharbi ⁷, Sarah Alanazi ⁸, Majed Alqahtani ⁹**¹ Department of Oral and Maxillofacial Surgery, King Fahad Hospital, Al-Hofuf, Saudi Arabia² Department of Dentistry, Salwa General Hospital, Salwa, Saudi Arabia³ Primary Health Care, Ministry of Health, Al Qurayyat, Saudi Arabia⁴ Department of Dentistry, King Saud Medical City, Riyadh, Saudi Arabia⁵ College of Dentistry, Alfarabi Colleges, Riyadh, Saudi Arabia⁶ Department of Dentistry, Dr. Nizar Ghulam Dental Group, Medina, Saudi Arabia⁷ College of Dentistry, Taiba University, Medina, Saudi Arabia⁸ Department of Oral and Maxillofacial Surgery, King Abdullah Medical Complex, Jeddah, Saudi Arabia⁹ Primary Health Care, Ministry of Health, Aljouf, Saudi Arabia**Abstract:**

Oral cysts are commonly seen by patients at outpatients' clinics, and because of their heterogeneity, it is essential for dentists to be well oriented to their types and classification. Many classification systems exist for oral cysts. They can be classified according to their site, their aetiology, and their embryogenic origin. To date, several treatment options are available for management of different types of oral cysts. Proper management of each oral cyst requires an appropriate diagnosis of its type and classification. Therefore, this article aims at reviewing and summarizing the classification and the aetiology of the most common oral cysts and discussing their main lines of treatment.

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INTRODUCTION:

Oral cysts are commonly seen by dentists at outpatient clinics and are sometimes difficult to diagnose¹. The oral cavity has a unique structure formed of a combination of different tissues with various embryonic origins and, therefore, is a site of multiple types of cysts [1]. Basically, a cyst is defined as an abnormal cavity in human body lined by an epithelial layer and containing a substance [2]. This substance may be gas, liquid, or semi-solid material such as air, saliva or pus, respectively. If the cavity was not lined by an epithelial layer, it is referred to as "pseudocyst"[2]. The oral cavity and the jaw are common sites for cysts and pseudocysts and, thus, it is essential for dentists to identify the various types of these cysts, their classification, etiology, and appropriate management [1].

This article aims at quickly reviewing and summarizing the main oral cysts types, classification, etiology, and management.

CLASSIFICATION AND ETIOLOGY OF ORAL CYSTS

Many systems were proposed to classify oral cysts. Oral cysts can be classified according to their embryogenic origin, their etiology, their consistency (i.e. soft or hard tissue), and their site. The most widely used classification is based upon the site of the oral cyst. According to their site, oral cysts are classified into intraosseous cysts and soft tissue cysts [2]. Intraosseous cysts may be either odontogenic or non-odontogenic. Examples of odontogenic intraosseous cysts include paradental cysts, apical periodontal cysts, dentigerous cysts, collateral cysts, odontogenic keratocysts, residual cysts, and calcifying odontogenic cysts [2,3]. Non-odontogenic intraosseous cysts include nasolabial cysts and nasopalatine duct cyst. Epidermoid cysts, dermoid cysts, cysts of salivary glands, lingual cysts, and cystic hygromas exemplify soft tissue cysts. Oral cysts can be also classified according to their etiology. Some cysts are developmental, whilst others are acquired. Examples of developmental cysts include calcifying odontogenic cysts, dentigerous cysts, dermoid cysts, epidermoid cysts, nasolabial cysts, and nasopalatine duct cysts. Acquired cysts (mostly due to inflammation) include paradental cysts, apical periodontal cysts, collateral cysts, residual cysts, salivary gland cysts, and cystic hygromas. The classification of oral cysts according to their site and etiology is demonstrated in table 1.

Table 1: Classification of oral cysts according to their site and etiology

	Intraosseous cysts		Soft tissue cysts
	Odontogenic	Non-odontogenic	
Developmental	Dentigerous cysts Odontogenic keratocysts Calcifying odontogenic cysts	Nasolabial cysts Nasopalatine duct cysts	Epidermoid cysts Dermoid cysts
Inflammatory	Apical periodontal cysts Residual cysts Paradental cysts Collateral cysts	---	Salivary gland cysts Lingual cysts Cystic hygroma

The intraosseous cysts are the most common types of cysts originating at the oral cavity [1]. Though very common, they are often asymptomatic and not diagnosed except when they reach a large size. Small intraosseous cysts are only diagnosed accidentally on radiological images. This is partly due to their deep position and partly due to their very slow growth rates. When intraosseous cysts reach a considerable size, they present clinically with a hard swelling on the gums displacing adjacent teeth and causing facial asymmetry. On physical examination, a characteristic egg-shell cracking can be elicited on gentle percussion on the swelling due to significant thinning out of the overlying bone [2,4]. In advanced stages, secondary infection and mucosal laceration may complicate the intraosseous cysts. Intraosseous cysts may be developmental or inflammatory and odontogenic or non-odontogenic [2].

The most common developmental intraosseous odontogenic cysts are dentigerous cysts, odontogenic keratocysts, and calcifying odontogenic cysts². Dentigerous odontogenic cyst is the most common developmental odontogenic cyst and the second most common type of all odontogenic cysts, after apical periodontal cysts, constituting about one fifth of all of these cases [5,6]. They result from failure of eruption after the stage of amelogenesis of dentition during embryogenesis. Dentigerous cysts arise at the cemento-enamel junction enclosing the crown of the unruptured dentition⁵. Their diagnosis is fairly difficult, and histological studying may be essential

for differentiation from other types of cysts. Dentigerous cysts are characteristically lined by cuboidal or, sometimes, low columnar epithelium [5,6]. The next most common developmental odontogenic intraosseous cyst is the odontogenic keratocysts. They originate from remnants of the lamina covering the teeth and often occur at the posterior mandibular rami [7]. They have a thin fibrous capsule, cystic contents, and characteristic para-keratinization. Odontogenic keratocysts have distinguishable clinical and physical characteristics that make them easily differentiated from many oral cysts. For instance, they grow very rapidly reaching large sizes at early ages, they occur at younger age, they have a high recurrence rate, and they are often difficult to treat [8-10]. Due to their apparent aggressive behavior, odontogenic keratocysts were thought to be malignant. However, no evidence of metastasis or local invasive behavior was revealed [11,12].

As regards the inflammatory intraosseous cysts, apical periodontal cysts, residual cysts, paradental cysts, and collateral cysts are distinct examples [1,2]. An apical periodontal cyst (also known as radicular odontogenic cyst or radicular odontoma) is the most common type of odontogenic oral cysts constituting more than one half of these lesions [13]. As the name indicates, apical periodontal cysts are acquired cysts that usually result from chronic inflammation of the apices of unhealthy carious or non-vital teeth. History of odontoid therapy failure or preceding trauma is usually encountered. Periodontal cysts affect the anterior maxilla and expand buccally [14,15]. If the affected non-vital tooth was extracted and the periodontal cyst did not resolve completely, a residual odontogenic cyst evolves. Residual odontogenic cysts are histologically similar to the apical periodontal cysts except that their walls reveal less inflammatory changes [4,16]. Paradental cysts, on the other hand, arise on top of vital teeth. They result from inflammation associated with buccal furcation particularly with the lower third molars [17,18].

The most common intraosseous non-odontogenic cysts are nasopalatine duct cysts and nasolabial cysts. Both are developmental cysts that arise from the oral cavity bones away from the dentition [19]. Nasopalatine duct cyst is more common that arise from remnants of the embryonic ducts. They typically originate at the incisive canal. However, the adjacent teeth are not affected. Nasopalatine duct cysts grow slowly and may remain asymptomatic or unnoticed for many decades [20]. They commonly present

between the ages 20-60 years and were noted in cadaveric studies as well [2]. Nasolabial cysts originate between the upper lip and the nasal alar cartilage particularly in females between 20-40 years [21].

Soft tissue cysts include developmental cysts (such as dermoid, cysts, epidermoid cysts, and thyroglossal cysts) and acquired cysts (such as salivary gland cysts) [2]. Dermoid and epidermoid cysts are rare oral cysts that are often asymptomatic. They can be accidentally seen at the floor of the mouth particularly adjacent to the submandibular and sublingual salivary glands. The main difference between the two types of cysts is histological. Epidermoid cysts are lined by epidermis-like epithelium whereas dermoid cysts are lined by ectodermal cells [22,23]. Thyroglossal cysts arise from remnants of migration of the thyroid gland from foramen caecum of the tongue. They are differentiated from dermoid cyst by their movement with swallowing or tongue protrusion [24]. The most common acquired oral cysts are salivary gland cysts (also known as mucoceles). Salivary gland cysts usually result from excessive production of mucous from the salivary glands resulting in clogging and obstruction of the salivary ducts. They are often seen along the ducts of the salivary glands particularly at the floor of the mouth and at the lower lips [25].

TREATMENT OF ORAL CYSTS

Several lines of treatment are available for oral cysts. Some cysts do not necessitate any intervention and are just observed and followed-up. Others, on the other and, require a dental intervention for eradication of the cyst. Common dental interventions for oral cysts include local excision, extraction, endodontics, marsupialisation, apicectomy, and enucleation with or without an additional measure. Surgical excision of an oral cyst is usually localized. Wide excision with a safety margin is rarely indicated except in cases of recurrent odontogenic keratocytes to prevent further recurrence. The use of supplementary treatment (such as Carnoy's solution) may also be indicated in these cases. Optimal removal of the oral cyst should ensure complete eradication of the cyst, allowing rapid healing, ensuring quick restoration of function, and prevention of cyst recurrence.

Each type of cysts has a preferred line of treatment. For instance, apical periodontal cysts are best removed by simple endodontic treatment. Simple endodontic treatment implies removal of the unhealthy tooth, its infected pulp, the root canal, and the pulp chamber. This ensures best cleaning and

decontamination of the infected structures and the underlying cysts [26]. Other lines of treatment of apical periodontal cyst include apicectomy with or without cyst enucleation, retrograde filling of the dental root, and extraction of the associated tooth with or without cyst enucleation [2]. Enucleation is the process of the entire removal of the whole cyst and cyst lining. After removal, blood clots fill the underlying space and subsequently organize and remodel enhancing bony repair. Enucleation is not only used in removal of apical periodontal cysts, but also in treatment of residual cysts, dentigerous cysts, and the vast majority of intraosseous cysts. In large-sized cysts, aspiration of the contents of the cyst helps the process of enucleation as it enhances the separation of the cyst wall from the surroundings. This does not only facilitate whole cyst enucleation, but also prevent its rupture. Dentigerous cysts are best treated with enucleation with or without extraction of the associated root. In cases where potential nerve injury is of high risk, coronectomy is a better choice [27,28].

Odontogenic keratocysts, as aforementioned, have a high rate of recurrence. Thus, enucleation is always performed with another supplementary treatment to ensure the whole cyst was destroyed. Enucleation of odontogenic keratocysts is carried out with either cryotherapy of the underlying tissue or application of Carnoy's solution. Carnoy's solution is used for fixation of the underlying dental tissue and is composed of glacial acetate, ethanol, chloroform, and ferric chloride. Applying Carnoy's solution was found to significantly reduce recurrence of odontogenic keratocysts [29,30]. Both cryotherapy and Carnoy's solution also aid in destruction of the cyst lining.

Nasopalatine duct cysts can also be managed by enucleation. The process is carried out via creating a palatal flap between both canines [20]. Nasolabial cysts are best enucleated intra-orally [21]. Dermoid and epidermoid cysts are also treated by enucleation either intraorally or extra-orally or both. A drain may be inserted for one or two days to get rid of any collecting hematoma [19,23]. Salivary gland cysts are also excised and enucleated intra-orally and a supplementary treatment may be indicated to prevent recurrence [2].

Marsupialisation is another treatment line sometimes used in management of oral cysts [31]. It implies making a hole in the cyst wall, overlying mucosa, and underlying periosteum. This hole allows decompression of the cyst lumen and removal of the cyst contents for histological examination [31]. The

hole is kept patent via suturing the cyst lining to the adjacent mucosa, and a pack is inserted for at least 10 days inside the cyst cavity. The main advantage of the marsupialisation is the minimal associated injuries to the surrounding soft tissue. Marsupialisation also allows the cyst lining to be replaced by the invading tissue from the adjacent mucosa². However, it is not preferred by many dentists because of its inconvenience for various patients and the need for frequent follow-up visits. Therefore, enucleation has widely replaced this process in the vast majority of oral cysts cases [2].

CONCLUSION:

Many classification systems exist for the oral cysts. Oral cysts can be classified according to their aetiology, their site, or their embryogenic origin. They can be intraosseous or soft tissue cysts, odontogenic or non-odontogenic, and developmental or acquired. The most common intraosseous cysts are apical periodontal cysts, dentigerous cysts, and odontogenic keratocysts, whereas the most common soft tissue cysts are salivary glands cysts. Many treatment options are available for oral cysts, and the treatment is tailored according to each particular cyst according to its type, site, and size. The most common treatment options are local excision, extraction, endodontics, marsupialisation, apicectomy, and enucleation with or without an additional measure (e.g. cryotherapy or application of Carnoy's solution).

Conflict Of Interest: none to declare

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