



RADICULAR CYST MASQUERADING AS A BENIGN JAW SWELLING: A DIAGNOSTIC CHALLENGE

Dental Science

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ABSTRACT

Inflammatory lesions, including odontogenic cysts, can involve the oral and maxillofacial regions. Dental caries or trauma to the teeth leads to sequelae of inflammatory periapical lesions resulting in pulpal necrosis which allows bacteria to enter the periapical tissues. Radicular cysts are common cysts, arising from epithelial remnants in the periodontal ligament which are associated with non-vital teeth and are generally asymptomatic. This case illustrates a 31-year-old male patient who reported to the Department of Oral Medicine and Radiology with the chief complaint of discoloration of a tooth and its associated swelling in the upper front region of the jaw. Clinically, the swelling was non-tender and soft to firm in consistency. Radiographic evaluation revealed, a periapical radiolucency with hyperostotic borders. A provisional diagnosis of a radicular cyst was given based on both clinical and radiographic findings. The diagnosis was subsequently confirmed through histopathological examination.

KEYWORDS

inflammatory odontogenic cyst, radicular cyst, pulp necrosis, trauma.

INTRODUCTION:

A cyst is a pathological cavity filled with fluid, semifluid, or gaseous content, which is not created by the accumulation of pus. It may or may not be lined by epithelium¹. A cyst comprises of a central cavity (lumen), an epithelial lining, and an outer capsule. The cystic cavity contains fluid or semi-solid material, i.e. cellular debris, keratin, or mucus. The epithelial lining varies as keratinised or non-keratinised, consisting of stratified squamous, pseudostratified, columnar, or cuboidal cells. The cystic wall contains connective tissue i.e. fibroblasts and blood vessels and chronic inflammatory infiltrate^(1,2,3).

A radicular cyst, also known as a periapical cyst or root end cyst or dental cyst, is the most common inflammatory odontogenic cyst originating from epithelial rests of Malassez¹. These are small islands and strands of odontogenic epithelium found in the periodontal ligament, derived from the remnants of Hertwig's epithelial root sheath, which surrounds a developing root². It is a sequela of periapical granuloma which forms at the apex of tooth. Almost 60% of all odontogenic cysts are radicular cysts and approximately 7% to 54% of all cysts affects the permanent dentition¹². The most common site involvement is the anterior maxilla in incisor and canine region, comprising about 50% of cases.

There is equal gender predilection, slightly more common in females most cases occurring in third and fourth decades of life^(9,12). A periapical cyst may be associated with a non-vital tooth, swelling, or pus discharge in the affected region. The patient may remain asymptomatic unless there is an episode of acute inflammation². Thus, this case study highlights the importance of thorough clinical, radiographic, and histopathological evaluations for achieving an accurate diagnosis.

CASE STUDY:

A 31-year-old male patient reported to the Oral Medicine and Radiology department with the chief complaint of discoloration and swelling in the upper front region of the jaw for 3-4 years (Figure 1). The patient was asymptomatic for 3-4 years; following, he saw a small swelling over the upper anterior region of the jaw, which was increasing in size. A history of trauma is present in the upper anterior region of the jaw for 3-4 years. Patient sought dental treatment from the local dental clinic 4-5 days prior and was prescribed medications (analgesics) for the same. As his swelling did not subside after taking medications, he visited the dental OPD. The patient reports a previous tooth extraction in the lower left posterior region and a completed root canal treatment with a metal crown placement in the lower right posterior region of the jaw. The patient has a history of smoking for the past 4 to 5 years, with a daily intake of approximately 3 to 4 cigarettes.

Figure 1: Intraoral examination showing discoloration with 21.



INTRAORAL EXAMINATION:

- On inspection, dome-shaped single palatal swelling extending from mesiodistally involving 21 and 22 region and supero-inferiorly involving the anterior 2/3rd of the hard palate; size of the swelling 10mm x 10mm approx. The shape was roughly oval with a smooth surface, diffused margins, and colour similar to adjacent mucosa. A pulp vitality test was performed using an electric pulp tester, which showed a negative response with 21 and 22.
- On palpation, the swelling was fixed to the underlying structures, and soft to firm in consistency.
- White leathery lesions of the palate followed by a whitish palatal mucosa reflecting a hyperkeratosis, s/o smoker's palate (Figure 2).



Figure 2: Intraoral examination showing dome shaped palatal swelling with diffuse whitening on the hard palate.



Figure 3: Intraoral periapical radiograph showing irregular, ill-defined radiolucency extending mesiodistally from the mesial aspect of 21 to the mesial aspect of 23 and superioinferiorly from the apical 1/3rd of 21 and 22 to the floor of the nasal cavity, size approximately = 1.5cm X 1.5cm showing cyst in cyst appearance with hyperostotic borders. Gross root resorption was seen in 21, and slight root resorption in 22.

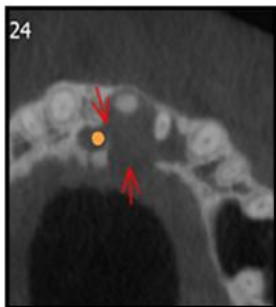


Figure 4: Reconstructed OPG radiographic examination reveals a large unilocular ill-defined radiolucency with hyperostotic border corresponding to 21 and 22 and impacted with 28 in transposition.

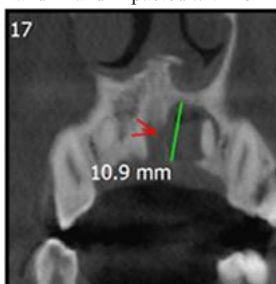


Figure 5: 3D Reconstructed image reveals cyst in cyst appearance.



Figure 6: Axial View: Evidence of loss of palatal cortical plate with radiolucency involving incisive foramen.



Figure 7: Coronal View: Radiolucency noted to be involving the incisive foramen.



Figure 8: Fine needle aspiration revealed serosanguinous fluid.

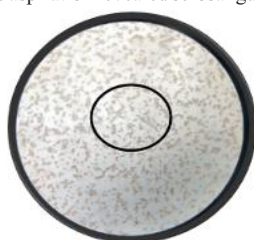


Figure 9: Cholesterol crystals impart a shimmering (shining gold) appearance.

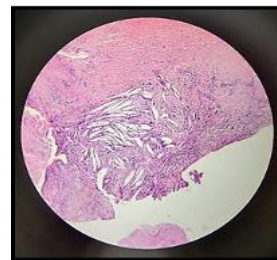


Figure 10 (a) 4X Histopathological View (H & E staining): non-keratinized stratified squamous epithelial lining characterized by elongated, irregular rete ridges forming a distinctive arcading pattern.

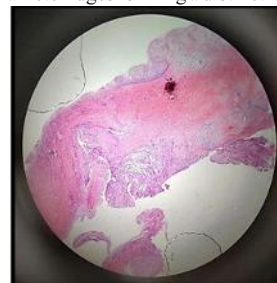


Figure 10 (b) 10X Histopathological View (H & E staining): The connective tissue showed a chronic inflammatory infiltrate predominantly lymphocytes and plasma cells, along with abundant collections of foamy histiocytes and focal areas of cholesterol cleft formation.

INVESTIGATIONS:

The patient was advised to undergo radiographic investigations, an intraoral periapical radiograph (IOPA), and a cone beam computed tomography (CBCT) scan, along with routine laboratory investigations. IOPA examination with 21 and 22 revealed irregular, ill-defined radiolucency extending mesiodistally from the mesial aspect of 21 to the mesial aspect of 23 and superioinferiorly from the apical 1/3rd of 21 and 22 to the floor of the nasal cavity, size approximately = 1.5cm X 1.5cm, showing cyst in cyst appearance with hyperostotic borders. Obliteration of PDL space in the apical, middle, and cervical 1/3rd of the root and loss of lamina dura at apical, middle, and cervical 1/3rd of the root. Gross root resorption was seen in 21, and slight root resorption in 22. Surrounding structures and bone pattern appear to be altered. Gross destruction with 21 and slight alteration with 22 was noted (Figure 3). Reconstructed OPG radiographic examination revealed a large unilocular, ill-defined radiolucency with a hyperostotic border corresponding to 21 and 22 and impacted with 28 in transposition (Figure 4). Gross evaluation of the maxilla (REGION 21, 22) was done using CBCT. CBCT of the maxilla of FOV (5x5) was performed on CARESTREAM 3D® classic. Cross-sectional slices of resolution 0.1mm (high definition) were obtained at 1 mm interval reveals irregular, ill-defined radiolucency extending mesiodistally from the mesial aspect of 21 to the mesial aspect of 23 and superioinferiorly from the apical 1/3rd of 21 and 22 to the floor of the nasal cavity, with a size approximately = 1.5cm X 1.5cm showing cyst in cyst appearance with hyperostotic borders (Figure 5,6,7).

Routine laboratory investigations were within normal limits. Fine needle aspiration yielded serosanguinous fluid containing a dense infiltrate predominantly composed of polymorphonuclear leukocytes. A few scattered epithelial cells were observed, which appeared normal in size, shape, and morphology (Figure 8). The cytological findings were indicative of an acute inflammatory process with nodules of opaque yellow crystalline material, representing cholesterol. Cholesterol crystals impart a shimmering (shining gold) appearance (Figure 9). Based on the clinical presentation, radiographic findings, and aspirate analysis, a provisional diagnosis of an infected radicular cyst was established.

The histological examination revealed a non-keratinized stratified squamous epithelial lining characterized by elongated, irregular rete ridges forming a distinctive arcading pattern. The connective tissue showed a chronic inflammatory infiltrate predominantly of

lymphocytes and plasma cells, along with abundant collections of foamy histiocytes and focal areas of cholesterol cleft formation. Numerous newly formed blood vessels were present, accompanied by areas of hemorrhage. Based on these histopathological features, a definitive diagnosis of a Radicular Cyst associated with teeth 21 and 22 was given [Figure 10 (a), (b)].

DIFFERENTIAL DIAGNOSIS:

Based on a thorough histology, detailed clinical examination, and radiographic evaluation, the following differential diagnoses for the present lesion have been considered.

According to Wood and Goaz, if a well-defined radiolucency is present at the apex of an untreated, asymptomatic tooth with a nonvital or diseased pulp, and normal anatomic structures are excluded, there is a 90% probability that the lesion is either a periapical granuloma or a radicular cyst⁶. Although these two conditions cannot be reliably differentiated based on radiographic appearance alone, a radiolucency measuring 1.6 cm (or 200 mm²) or larger is more suggestive of a cystic lesion^(6,17). The pulps of associated teeth are usually vital in traumatic bone cysts and can be mistaken for a periapical granuloma or cyst.^(5,6) Approximately 90% of traumatic bone cysts develops in the mandible, mostly in the molar, premolar, and incisor regions². Periapical cysts and granulomas have less predilection for the lower jaw and are more common in the anterior region. In traumatic bone cyst, periapically lamina dura appears to be intact^(6,11).

DISCUSSION:

A cyst is a pathological cavity filled with fluid, semifluid, or gaseous content, which is not created by the accumulation of pus. It may or may not be lined by epithelium- Kramer 19741. A cyst comprises of a central cavity (lumen), an epithelial lining, and an outer capsule. The cystic cavity contains fluid or semi-solid material, i.e. cellular debris, keratin, or mucus. The epithelial lining differs among cyst types and may be keratinised or non-keratinised, consisting of stratified squamous, pseudostratified, columnar, or cuboidal cells. The cystic wall is composed of connective tissue containing fibroblasts and blood vessels^(1,2,3).

Radicular cysts are common cysts of the odontogenic inflammatory origin, also called a periapical cyst, apical periodontal cyst, and root end cyst². It comprises about 52 to 68% of all the cysts. Prevalence of the radicular cysts within the maxilla is more common as compared to mandible with buccal or palatal expansion. The radicular cyst is unusually large in size when the entire maxillary sinus and floor of the nose are involved^(2,3).

The pathogenesis of radicular cyst has been explained by three phases: 1. The phase of initiation, 2. The phase of cyst formation, 3. The phase of cyst enlargement^(1,12). Dental caries or trauma results in periapical inflammation which stimulates cell rests of Malassez and epithelial cells to undergo necrosis to form cyst, which may become secondarily infected. The cysts derived from the cell rests of Malassez from fistula or oral epithelium proliferates resulting in cyst formation. The epithelial proliferation caused by periapical anaerobic infection activates the innate and acquired immunity¹². The progressive growth of an epithelial island makes the innermost cells go away from their nutrients, central cells undergo ischemic liquefactive necrosis forming cystic cavity. An osmotic gradient within the cystic lumen causes fluid accumulation and increase in hydrostatic pressure resulting in cyst expansion. The factors responsible for growth of cyst are mural epithelial proliferation, increased hydrostatic pressure and bone resorbing factor^(12,17). Mast cells plays an important role in release of heparin, hydrolytic enzymes and histamines causing cyst to enlarge. Studies report PCNA and Ki-67, markers present in cells, stages of cell-division except G-0 phase are increased in cells of epithelial lining. The mitogens involved in pathogenesis of radicular cyst are EGF and KGF, TGF- α , and IGF (Insulin- like growth factor) released by fibroblasts and chronic inflammatory infiltrate¹².

Clinically, a radicular cyst is asymptomatic associated with non-vital tooth. The most common site of involvement incisors and canine regions. The cyst tends to increases in size causing cortical plate expansion, eggshell crackling². Radiographically, a large, ill-defined radiolucent lesion was seen on both conventional radiographs and CBCT imaging^(5,6). CBCT also revealed a large unilocular ill-defined radiolucency with a hyperostotic border and loss of palatal cortical plate showing cyst in cyst appearance, suggestive of radicular cyst¹.

Histologically, a radicular cyst is a non-keratinized stratified squamous epithelial lining with an arcing pattern, Rushton bodies, and a connective tissue wall with inflammatory cells, along with abundant collections of foamy histiocytes and cholesterol clefts². The management of the radicular cyst depends on the dimensions and localization of the lesion. Endodontic therapy, extraction, surgical procedures such as enucleation, and marsupialization are all alternatives for its treatment^(11,19).

A few case reports suggest that squamous cell carcinoma can develop from metaplastic changes occurring within the epithelial lining of radicular cysts. A report in the literature notes that the proliferation within the epithelial lining of radicular cyst leads to formation of squamous odontogenic tumor¹⁸. The prevalence (3.5%) of such transformation is more common in maxilla than mandible. It is necessary to treat radicular cyst in order to prevent complications and clinicians should remain aware of the risk of malignant transformation into squamous cell carcinoma.

CONCLUSION:

On the basis of clinical evaluation, radiographic findings, cytological, and histopathological examination, the lesion was diagnosed as a radicular cyst. Clinically, it is a slow-growing, asymptomatic swelling associated with an inflammatory odontogenic origin. Radiographically, a ill-defined, periapical radiolucency with hyperostotic borders was characteristic of a radicular cyst. FNAC reveals presence of inflammatory cells and cystic contents suggestive of an inflammatory cystic lesion while a confirmed diagnosis was made histopathologically, by demonstrating a cystic cavity lined by non-keratinized stratified squamous epithelium with an inflamed fibrous connective tissue capsule. Thus, the convergence of clinical, radiographic, cytological, and histopathological examination highlights the importance of comprehensive, multidisciplinary approach for accurate diagnosis and appropriate management of radicular cysts.

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