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Surgical Rehabilitation of a Mandibular Radicular Cyst in a 13 Year Old: A Case Report

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Abstract:
Radicular cysts are odontogenic cysts formed due to a chronic inflammatory response to epithelial rests of Malassez found in the periodontium. It usually remains asymptomatic until a secondary infection or seen radiographically. This is a case report on the presence of a radicular cyst in a 13 year old male patient along with a literature review of the origin and management of cysts.

Keywords:-Rehabilitation, radicular cyst, surgical management, pediatric dentistry

Introduction:

The most frequent cause of endodontic periapical lesions is infections of the pulp(Kuc, Peters, and Pan 2000; Deepak, Prabakar, and Jeevitha 2020). According to Seltzer et al. (1967), an infection caused by bacteria and their byproducts that escape the apical foramen usually results in an inflammatory reaction that causes the alveolar bone that surrounds the root to resorb(Nivetha, Sri Sakthi, and Arvind 2020). The lesions of endodontic origin might either be periapical granulomas or radicular cysts. According to Lalonde and Luebke (1968), radicular cysts are present in periapical lesions between 6 and 55% of the time and in periapical granulomas between 46 and 84% of the time.

The term cyst was coined by Kramer in 1947, a fluid, semi fluid or gaseous filled pathologic cavity that is not created by the accumulation of pus and is often but not always lined by an epithelium(Hill and Renton 2017).

There are many types of cysts that occur but a jaw cyst which forms from a ligament of the periodontium is called a radicular cyst(Kahn and Michael 2001). It is one of the most common types of dental cysts wherein the apex of the tooth is involved. It is usually found in non vital teeth as a result of dental caries due to the necrotic pulp and formation of infection. Around 52 to 68% of dental cysts are radicular cysts and are mostly seen in the middle age population. It is most frequently seen in the maxilla than the mandible(Daley, Wysocki, and Pringle 1994).

A majority of the cysts that are seen in the jaws originate from odontogenic epithelium(Peters and Lau 2003). They are divided into inflammatory and developmental which is based on the site of origin(Regezi 2008; Ramani, Pandiar, et al. 2022). Epithelial rests of Malassez are the origin of the inflammatory cysts where the microbial end products which originate from the affected pulp initiate the proliferation of the epithelial rests(Ramachandran Nair, Pajarola, and Schroeder 1996). Radicular cysts are formed due to the proliferation of the cyst(Ramakrishnan et al. 2020). Radicular cysts are classified into Periapical cysts, Lateral radicular cysts and Residual cysts(H. B. G. Robinson 1945). Periapial cysts are seen at the root apex of the tooth affected. Lateral radicular cysts are observed at the opening of the lateral accessory root canals of the tooth. Residual cyst as the name indicates is found as remnants even after extraction of the tooth which was infected(Pandiar et al. 2021; R. Ahmed, Pradeep, and Muthusekhar 2021).

Dentigerous cysts and Keratocystic Odontogenic Tumour (KCOT) are the cysts that are of developmental origin (Hill and Renton 2017). Children between the ages of two and fourteen are frequently affected with dentigerous cysts. When compared to other cysts of odontogenic origin, KCOT are aggressive and more likely to recur (Johnson et al. 2014). They are located in the posterior region of the mandible. Cysts with this origin require additional and extensive surgical care.

Radiological features:

Radiographs are unable to distinguish between a cyst and a granuloma. Cysts are typically more visible on radiographs. When viewed radiographically, a cyst or granuloma will both appear radiolucent and be connected to non-vital teeth. Cysts often have a round to oval shape with thin radiopaque edges around them, although this is not the case if the cyst enlarges quickly, which may or may not be followed by root resorption (Robinson, 2017). The edges of the cyst become sclerotic if the cyst is secondary infected because of the inflammatory response of the surrounding bone, which leads to the loss or alteration of cortical bone. Small radiopacities are dispersed throughout the cystic cavity in rare instances of dystrophic calcification, which happens in long-standing cysts (Ramos-Perez et al. 2014). The cysts are observed to resorb roots, invade the maxillary antrum, and in some cases, displace the inferior alveolar nerve in the mandible (Harshitha, Varsha, and Deepa, n.d.; Balakrishna and Shivanni 2021; Reddy et al. 2020).

Pathological features:

Typically, the gross specimen has an ovoid or spherical form. The cyst's walls can be smooth or uneven in texture and range in thickness from extremely thin to 5mm. The hollow may have yellow nodules, and the fluid inside is typically brown as a result of haemoglobin breakdown. According to histopathology, it is seen to have odontogenic epithelium remnants, Rushton's hyaline bodies, cholesterol clefts, mast cells, and epithelial lining(Harshitha, Varsha, and Deepa, n.d.). The majority of radicular cysts have non-stratified squamous epithelium linings that range from one to fifty layers thick, with the exception of periapical lesions of the maxillary sinus, which have pseudo-stratified ciliated columnar epithelium or respiratory type epithelium linings. Radicular cysts exhibit cholesterol crystals for a variety of reasons, including the disintegration of lymphocytes, plasma cells, and macrophages that participate in the inflammatory process.(R. A. Robinson 2017).

Complications of radicular cysts

Failure to properly diagnose and treat radicular cysts may lead to complications like(Genji, Sharma, and Sandhya 2020):

Carcinomatous/Neoplastic Changes:-

Squamous Cell Carcinoma or Epidermoid Carcinoma can originate from epithelial lining of Radicular Cyst.

Pathologic Jaw Fracture:-

A Cyst has the ability to weaken and erode the surrounding bone. If completely eroded in the posterior region, it may lead to pathologic bone fracture.

Secondary Infection:-

Cyst may get secondarily infected and create further complications.

Treatment options

Depending on various factors like extent of lesion, origin, characteristics, proximity to noble structures and the systemic conditions of the patient, the mode of treatment is planned(T. Ahmed and Kaushal 2022). Treatment can be limited to endodontic management when the lesion is small, larger lesions can be managed which surgical treatment like enucleation, marsupliziation or decompression(Manwar, Agrawal, and Chandak 2011; Senthilkumar, Ramesh, and Nasim 2021).

When deciding on and organising the management of the cysts, the cystic nature of the cyst is crucial(Ramani, Krishnan, et al. 2022; Pandiar et al. 2021). Radicular cysts frequently have no symptoms until the infection causes discomfort and swelling. A prompt response is required; otherwise, the bone will expand and the roots will shift. The damaged teeth may become discoloured and develop periapical infection that leads to a dentoalveolar abscess.

Case Report:

A male patient of 13 years reported to the Department of Pedodontics and Preventive dentistry with pain and swelling in his lower right front tooth region for the past 2 weeks. An extra oral examination revealed a smooth superficial swelling from the corner of the mouth which extended to the lower border of the mandible and from the infraorbital margin to the lower border of the mandible which was 2x3 cm. The swelleing was firm and tender on palpation. The submandibular nodes on the ride side of the face were tender on palpation. Intraorally, class 1 deep caries was seen in relation to 44 and distal class 2 caries was seen in 43. Obliteration of the vestibule was observed as well as the expansion of the buccal and lingual bone in relation to 43,44. The teeth were tender on percussion and 44 had a grade 1 mobility.

During the first visit, emergency access opening was done and incision and drainage was done in relation to 43,44. Antibiotics were given for a period of 5 days to resolve the swelling. Root canal was done in the second

sitting in 43 and 44 and restored with GIC as an entrance filling and the child was scheduled for enucleation the next day under General anaesthesia.

On the right side, a crevicular incision was made from the distal surface of the lateral incisor till the mesial surface of the second premolar. The flap was elevated was the cortical bone was visualized. Necrotic bone was visualized in relation in relation to 44. Ostectomy was performed successfully with a round carbide bur which was done to enlarge the bony defect to a buccal window which allowed access to the cystic structure and roots of 43,44. Apicetomy was done in 43, 44, 3mm of the root was removed using a straight fissure carbide bur which was held perpendicular to the long axis of the tooth. The guttapercha cones was exposed and 1mm was removed from the apex. MTA was placed at the apex as a retrograde preparation. The debris and guttapercha was removed using saline irrigation for 30 seconds. Necrotic bone was removed with a bone file and the cavity was irrigated with a saline solution. Bone graft was placed in the cavity and the flap was repositioned and sutured. The tissue specimens were sent for histopathological examination.

Fig 1: Pre op IOPA of 43,44

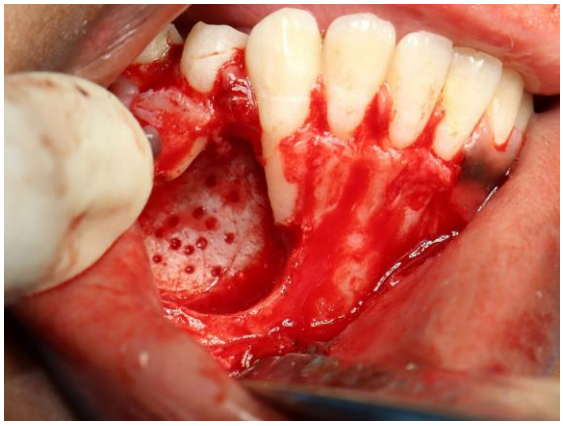

Fig 2: Enucleation of cyst and necrotic bone

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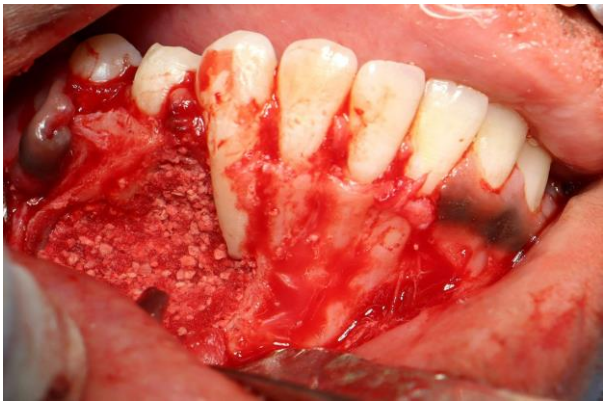

Fig 3: Placement of bone graft

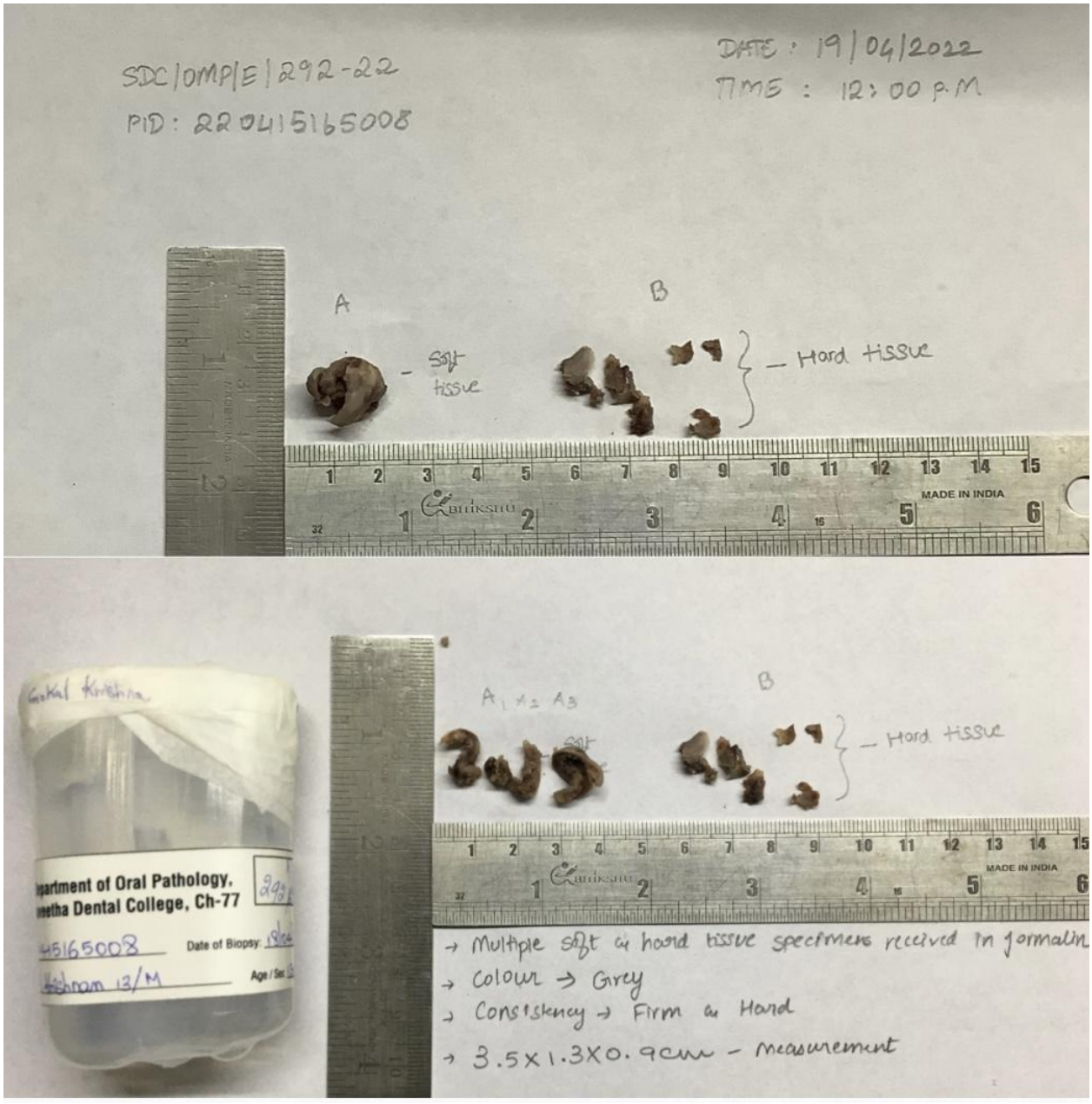

Fig 4: Gross section of specimen

Fig 5 : Two week post op IOPA of 43,44

Fig 6 : One year post op IOPA of 43,44

Histological Findings:

The sections of tissue showed odontogenic epithelial lining and an intact connective tissue wall. The odontogenic epithelial lining is non keratinised stratified squamous epithelium of variable thickness with predominantly 10-15 cell thickness with inflammatory cells seen within the epithelium. The underlying connective tissue wall shows intense chronic inflammatory cell infiltrate predominantly consisting of lymphocytes and plasma cells along with intense vaularity, peripheral resorbing bone, skeletal muscles and areas of hemmorrhage. Hence correlating the clinical, radiographic and hisopatologic features the final diagnosis was suggestive of an Inflammatroy odontogenic cyst- Radicular cyst.

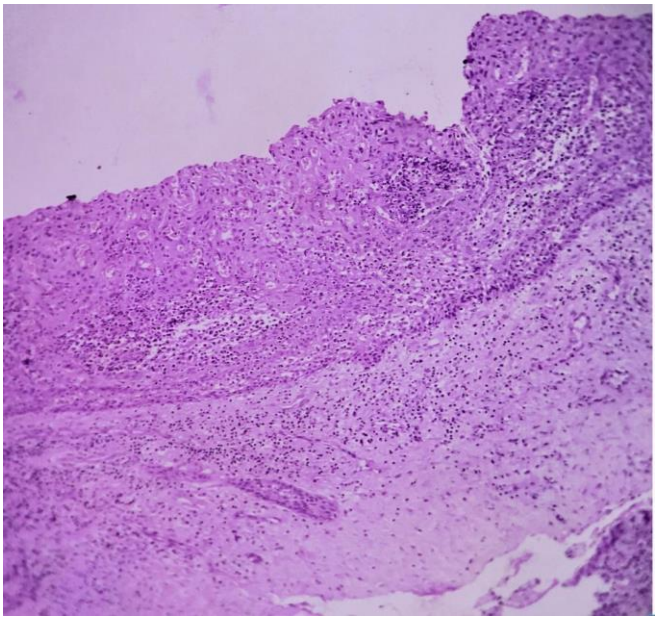

Fig 7 : Histological view of excised cyst

After two weeks, tooth preparation was done in 44 and an acrylic crown was given and in 43 a composite restoration was done due to minimal loss of structure. The patient has been followed up for a year and shows no signs and symptoms. Adequate bone formation and healing has been observed.

Discussion:

The epithelial cell rests of Malassez are from where the radicular cyst, also known as dental cyst or periapical cyst primarily originates from. They usually remain asymptomatic until a secondary infection occurs. These can be detected radiographically and roots of the teeth involved are displaced. When the secondary infection occurs, the lesion develops signs and symptoms, tooth mobility, swelling and pus discharge. This is most frequent in the maxillary region during the third to fifth decade of life. However in the present case, the cyst involved two maxillary teeth in a 13 year old. There are three distinct phases for the pathogenesis of radicular cysts - phase of initiation, the phase of formation and phase of enlargement. In our study, the child reported with pain and dentoalveolar abscess in relation to the lower anteriors. The two teeth associated were carious, non vital and discoloured. The management of radicular cysts depends on the extension of lesions, clinical signs or symptoms and the overall health and medical history. When the lesion is small, conventional rct is only required but when the lesion is extensive surgical treatment like enucleation, marsupialization and decompression should be carried out. This case required enucleation of the large radicular cyst prior to root canal treatment.

Conclusion:

For the management of radicular cysts there are various treatment options available depending on the extent and size of the lesion. In this case as the lesion was extensive in nature and involved the canine and premolar, root canal therapy followed by enulcelation and apicetomy was done. A one year followup showed adequate bone healing.

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