CASE REPORT

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Analysis of four periapical inflammatory lesions findings on periapical radiographs: a case report

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ABSTRACT

Objectives: To analyze four periapical inflammatory lesions on periapical radiographs.

Case Report: A 20-year-old male patient came to RSIGMP-UMI, the results of the intraoral clinic examination showed that there was a crown restoration in the area of 13 to 23 that the patient had been using since ± 5 years ago. Discussion: Radiographs are a necessary supporting examination, especially after anamnesis and clinical examination for lesions involving bone tissue and its surrounding structure, periapical inflammatory lesions are the most commonly found pathological condition, defined as the local response of the bone around the dental apical.

Conclusion: Periapical radiographic examination is very helpful in determining the exact diagnosis and treatment plan as well as evaluating the treatment results of a case, especially in cases of periapical inflammatory lesions.

Keywords: *Periapical inflammatory lesions, periapical radiograph*
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INTRODUCTION

Periapical radiography is an intraoral radiography technique used to look at some of the teeth and supporting tissues around the apex. There are two techniques in taking periapical radiography, parallel and bisectary. Each periapical radiographic image shows two to four teeth that will give you a view from the crown to the surrounding alveolar bone. Periapical radiography can be used for periodontal status examination, endodontic procedures, evaluation of periapical cysts or other lesions on the alveolar bone, post-traumatic evaluation of teeth involving the alveolar bone, and evaluation of post-implant insertion and provide an overview of the detection of dental apical inflammation.[1]

A superficial lesion is a lesion or abnormality that involves the apical area of the tooth. Periapical lesions u saw are an advanced process of caries and untreated pulp abnormalities. Lesions or periapical abnormalities are lesions in the jawbone that are most commonly found in dental practice.[2]

Periapical lesions are sequels to endodontic infections caused by dental caries or trauma and manifest as a host's defense response to microbes originating in the root canal system. In the infected radicular pulp and periodontal ligaments, there is a reaction between microbial factors and host defenses resulting in local inflammation, resorption of hard tissue, and damage to the periapical tissue. Large periapical lesions are often present on the anterior maxillary teeth, which are thought to be caused by trauma. These lesions can be classified as granulomas, pocket cysts, and true cysts. Granulomas are usually made up of dense soft tissue, while cysts have a semi-solid or liquid central area that is usually surrounded by epithelium. Pocket cysts have an epithelial layer that is connected to the root canal and true cysts are completely lined by the epithelium and not connected to the root canal.[3]

In general, the formation of a radicular cyst consists of three stages, namely the initiation stage, the cyst formation stage and the cyst enlargement stage. At the initiation stage, the remnants of malassez cells in the periodontal ligament proliferate due to inflammation in the periaplic that causes granulomas. This is part of a local defense mechanism against chronic pulp inflammation so that the infection does not spread. The factors that trigger inflammation and the immune response that causes epithelial proliferation are thought to be due to bacterial endotoxins derived from necrotic pulp.[4]

Furthermore, at the stage of cyst formation, the rest of the malassez cells proliferate on the granuloma wall to form an enlarged epithelial mass. The lack of nutrients to the epithelial cells in the central part causes necrosis and thawing of the cells so that a fluid-filled cavity is formed that is restricted by the epithelium. At the stage of

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enlargement of the cyst, osmosis pressure is suspected to be an important factor.[4]

CASE REPORT

A 20-year-old male patient presented to RSIGMP-UMI with a referral for a periapical radiographic examination. Based on the anamnesis, the patient reported a tingling sensation in the anterior teeth of the upper jaw. Intraoral clinical examination (Figure 1) revealed a crown restoration in the 13–23 region, which had been in use for approximately 5 years. Swelling was observed at the apical area of tooth 21, with positive findings for palpation (+) and crepitation (+). The palatal mucosa appeared within normal limits. On examination of teeth 12, 11, and 22, the results were percussion (+), palpation (+), and thermal sensitivity (-).

The results of the periapical radiographic examination (Figure 2) revealed radiolucent lesions on teeth 12, 11, 21, and 22. Tooth 12 showed a dilated periodontal membrane at the apical third; tooth 11 exhibited a radiolucent lesion with a clear boundary measuring approximately 2 mm at the apical third; tooth 21 presented a radiolucent lesion with clear and well-defined borders measuring approximately 6 mm in diameter; and tooth 22 showed a radiolucent lesion with an ill-defined border at the apical third.

DISCUSSION

Periapical radiography is an important medical supporting data in the field of dentistry. By using additional data from dental radiography, the dentist's work will be more efficient, effective and get optimal success. The rate of use of dental radiography in the management of dental cases or diseases is quite high, reported to be more than 80%, so it can be said that in the practice of dentistry, dental radiography examination has currently been considered as a follow-up examination of objective or clinical examination.[2]

Radiography is an examination that needs to be done, especially after an anamnesis and clinical examination, especially for lesions involving bone tissue and its surroundings. When lesions are found in soft tissues close to bone, radiography can show whether the lesions are involving/originating in the bone or involve only soft tissue. Radiographic examination usually shows lesion characteristics such as in cysts there is a radiolucent picture surrounded by clear radiopaque boundaries.[5]

Periapical inflammatory lesions are the most commonly found pathological condition, defined as a local response of the bone around the apical of the tooth, which occurs as a result of pulp necrosis or through damage to the periapical tissue due to severe periodontal disease. Pulp necrosis can occur as a result of pulp invasion due to bacteria through caries or trauma, periapical inflammatory lesions are characterized by apicalis periodontitis, this inflammatory process histologically indicates a periapical abscess or periapical granuloma (Figure 3).[6]

APICAL PERIODONTITIS

Apical periodontitis is a common health problem. Epidemiological studies of apical periodontitis documented that the prevalence of apical periodontitis varies between patients aged 20 to 30 years (33% prevalence of apical periodontitis), 30 to 40 (40%), 40 to 50 (48%), 50 to 60 (57%), and older than 60 years (62%). Most of the research on the prevalence of apical periodontitis comes from European and Scandinavian countries. According to a survey conducted by the American Dental Association in 2005–06, an estimated 15.1 million root canal treatments are performed each year in the United States alone.[7] Apical periodontitis can be symptomatic or asymptomatic. Similar to pulpitis, apical periodontitis does not always cause symptoms or pain.[7]

On radiological examination, localized lesions in the candidiasis bone may not be radiographically visible unless cortical bones are involved. In addition, radiographic images cannot distinguish between apical granulomas and apical cysts. The absence of clinical symptoms and negative periapical radiographic findings on endodontically involved teeth do not necessarily indicate the absence of apical periodontitis. In the same way, the clinical success of endodontically involved teeth (i.e., the absence of signs and symptoms and negative periapical radiographic findings after non-surgical root canal therapy does not mean complete histological healing of periapical lesions. Thus, currently available diagnostic methods used in endodontics, such as clinical symptoms, percussion, palpation, pulp sensitivity tests (cold, heat,

Figure 1. Intraoral anterior view of the upper jaw and palatal region

Figure 2. Results of periapical radiograph

electrical), and radiographic imaging are not sensitive enough to provide an accurate diagnosis of periapical inflammatory lesions. However, the treatment of different types of periodontitis lesions is basically the same: non-surgical root canal therapy.[8]

PERIAPICAL ABSCESS

A periapical abscess is an infection that spreads from a nonvital tooth that forms on neutrophils, macrophages and necrotic debris. Periapical abscesses occur in the periapical area of the teeth that have been deceased/non-vital. Periapical abscesses are divided into two, namely acute and chronic periapical abscesses. In acute periapical abscesses it is accompanied by the formation of pusular exudates and swelling that is usually located in the buccaneous, lingual or palatal vestibulum, depending on the location of the apex of the tooth involved. In the acute periapical abscess percussion test will produce a very positive response, the palpation test will respond sensitively. Meanwhile, the vitality test did not respond. Chronic periapical abscess is a condition that arises from a lesion that lasts for a long time and then provides drainage to the surface. Fistula is a characteristic of a periapical abscess. A fistula is a pathological duct that forms as a result of abscess drainage.[5]

Periapical abscesses usually manifest with severe pain, mobility, and sometimes elevation of the affected tooth, swelling, and tenderness in the percussion. Palpation of the apical area causes pain. Spontaneous drainage into the oral cavity through a fistula (pais) can relieve acute pain. In rare cases, a tooth abscess may manifest with systemic symptoms (e.g. fever, facial swelling, lymphadenopathy) accompanied by pain. Acute lesions can develop into chronic lesions (granulomas or periapical cysts), which may show no symptoms unless intermittent "toothache" pain appears, which marks an acute exacerbation of chronic lesions. Patients often provide a history of intermittent pain. The associated tooth may be asymptomatic, or may be able to move or be sensitive to percussion.[9] In addition, sometimes patients with lymphadenopathy are found.[5] In the radiographic picture, it can be seen that the radiolucent image is rounded on the apex of the tooth with diffuse/diffuse boundaries, the periodontal membrane and lamina dura disappear on the apical root of the tooth.[5]

GRANULOMA

Granuloma is the most common disease that occurs due to the continuation of the disease from pulpitis or acute apical periodontitis. The spread of the disease is not always in the periapical direction, but the presence of lateral root canals or accessories, which are anatomical deviations, can be a pathway of infection by microorganisms. This can lead to the occurrence of lateral granulomas or other inflammatory lesions. Most periapical granuloma lesions can be seen on routine radiographic examinations, and are the most common periapical radiolucency seen in dental practice.[10]

Periapical granuloma in nonvital teeth functions as a self-protective response against bacterial invasion. However, its enlargement may disrupt surrounding tissues and cause resorption of supporting bone. Common causes include pulp inflammation, root apex infection, occlusal trauma, excessive orthodontic force, root perforation during endodontic treatment, periodontal infection spreading to the apex, and chemical irritation.[5]

Clinical symptoms of periapical granuloma can be asymptomatic and the teeth can also become sensitive to percussion arising due to edema, hyperemia, and inflammation of the apical periodontal ligaments, pain and discomfort in the teeth when chewing food, there is a history of previous pain (pulpitis) in the teeth which then disappears, the teeth involved are nonvital and do not respond to thermal or electric pulp testers, The tooth is slightly elongated from the socket and hurts when exposed to chewing pressure. Periapical granulomas and periapical cysts have identical radiographic images, periapical cysts can sometimes only be distinguished from granulomas by their size.[5]

In the radiographic picture, the granuloma appears as a radiolucent image, circular or ovoid that covers the root tip and extends to the periaplic. The trabecula of the alveolar bone may look like it is superimposed over the lesion, because the lesion has a grayish appearance and is not dark. The edges of the lesions are clearly bound.[5] Cysts and granulomas both have clear boundaries, but cysts have clear and firm boundaries that are marked by radiopaque marginal boundaries. While in periapical abscesses, there is usually a picture of dilation of the periodontal membrane, diffuse and indecisive limitations.[5]

PERIAPICAL CYST

A cyst is defined as a pathological cavity that contains fluid, semi-liquid, or gas and does not form due to pus accumulation. A periapical cyst is considered an inflammatory cyst due to the presence of dental caries or trauma.[11] Periapical cysts are the most common odontogenic cystic lesions of inflammatory origin involving the maxillary alveolar and mandibular bones. It is thought that the formation of radicular cysts is determined by the proliferation and degeneration

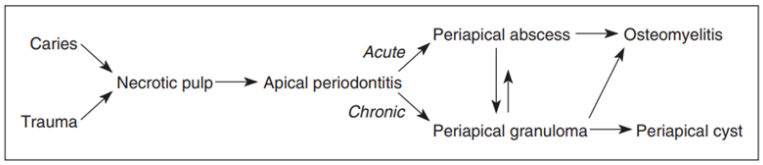

Figure 3. Possible outcome reciprocity in periapical inflammation[6]

of Malassez epithelial cells, which are stimulated by inflammatory processes derived from necrosis of the nonvital tooth pulp.[10,12]

Periapical cysts are also known as radicular cysts, apical periodontal cysts, root tip cysts or dental cysts. Periapical cysts are generally more common at the age of 30 to 50 years.[3] Radicular cysts are the most common cysts of the oral cavity. These cysts are closely related to the occurrence of very extensive caries, pulp necrosis, and infections that occur in the root canal of the tooth. 1-3 Occurs 60% of all cysts that occur in the oral cavity are radicular cysts.[10]

Radicular cysts often appear without any symptoms except when the infection is secondary. A cyst that develops large enough can cause swelling, in cases where the patient complains of swelling caused by osmotic pressure and the accumulation of metabolic products forms intracystic pressure which causes the cyst to enlarge and change the position of the surrounding tissues.[10] The most common incidence occurs in the third and fourth phases of life and is more common in men. These cysts are more common in the maxilla with the highest incidence rate located in the lateral incisival teeth. While in the mandible, the posterior tooth is the part of the tooth that is most often affected by this radicular cyst.[3] Radicular cysts are mostly asymptomatic and are found during routine periapical radiography of teeth with non-vital pulp. Over the years, these cysts can regress, remain static, or increase in size.[13]

Radicular cysts and granulomas cannot be distinguished radiographically because they appear to be radiolucent associated with the root and are firmly bounded, and usually with sclerotic bone in the periphery, but radiographically the periapical cyst appears to be an oval or pear-shaped unilocular radiolucency in the periapical region.[3] The area of radiolucent is circular around the apical part of the tooth affected by the infection, and the loss of the dura lamina can be observed along adjacent roots.[14] Cyst treatment can be in the form of non-surgical treatment or surgical treatment in the form of enucleation or marsupialization. Nonetheless, whatever the choice, treatment options should be kept as conservative as possible.[13]

Proper diagnosis of radicular cysts can lead to more conservative treatment approaches such as endodontic therapy vs enucleation, which greatly improves the patient's comfort and prognosis.[15] A more precise diagnosis can be achieved by histopathological examination, with confirmation of the lesion as a granuloma or cyst. Although conventional radiographic methods cannot be used for the definitive diagnosis of periapical cysts, it can be considered that a firmly demarcated round or oval radiolucent image of a larger size around the apex of the tooth is a cystic lesion. Periapical cysts are more common in the maxillary than mandibles. The maxillary anterior region appears to be more susceptible to cysts, while in the mandibles, it is more common in the premolar region.[3]

CONCLUSION

Periapical radiographic examination is very helpful in determining the exact diagnosis and treatment plan as well as evaluating the treatment results of a case, especially in cases of periapical inflammatory lesions. Periapical inflammatory lesions are the most commonly found pathological condition, defined as a local response of the bone around the apical of the tooth.

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FOOTNOTES

All authors have no potential conflict of interest to declare for this article. Informed consent was obtained from the patient for being included in this case report.

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