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CASE STUDY

Enucleation of radicular cyst in the maxillary area

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ABSTRACT

Radicular cyst is a true cyst that develops in association with a root of non-vital teeth. Radicular cyst is the most common cyst in the oral cavity with a percentage of 50% of all cysts in the oral cavity. Radicular cysts are usually asymptomatic and may cause swelling, tenderness, or tooth mobility. Another problem is due to the neoplastic transformation of the epithelial lining; however, this case is very uncommon. Management of radicular cysts consists of endodontic treatment, apicectomy on the root of non-vital teeth or decompression by enucleation, and extraction of the related teeth. A 63-year-old female patient came to RSGM Prof. Soedomo with a complaint of swollen gums in the area of upper front teeth that had been present for approximately a year with no associated pain. The patient previously had a panoramic X-ray examination, and the result revealed a radicular cyst. Biopsy aspiration results showed that there were cholesterol crystal-filled cysts. There was no history of systemic disease. The patient was treated by enucleation of the radicular cyst followed by extraction of the related teeth using general anesthesia. The patient was periodically evaluated postoperatively. The wound healing process was evaluated as expected, and the patient's complaints reduced. Clinical examination accompanied by radiographic examination and biopsy aspiration showed the presence of a radicular cyst. Treatment options, including cyst enucleation, depended on several factors, such as an expansion of the lesion, size and association of the cyst with surrounding tissue, as well as the patient's systemic condition. Irrigation and drainage of the bone cavity and curettage of the remaining tissue should be done to ensure the lesion has been removed completely. The remaining bone spicules were shaped and smoothed, and primary wound closure was performed in order to minimize recurrency and complication.

Keywords: enucleation; odontogenic cyst; radicular cyst

INTRODUCTION

Pulp necrosis is the most frequently complained dental condition by the Indonesian population. Throughout 2019, one provincial capital in Indonesia reported 465 of 610 patients, or 76% of patients, had pulp necrotic.[1] Radicular cysts arise from the remnants of odontogenic epithelial that are found in the root apex area of an infected or non-vital tooth or post-endodontic tooth. Radicular cysts account for 52-68% of all odontogenic cysts in the oral cavity. Radicular cysts mostly developed in the maxillary area rather than the mandibula, with a percentage of 60%.[2,3,4]

A study from a developed country revealed that the prevalence of radicular cysts in females was 53.67%, which is slightly higher than in male patients, with a ratio of 0.86:1 between male and female patients. This is because women in this country had delayed dental treatment because they prioritized looking after the household. Socio-economic condition also plays a role in receiving proper dental treatment. Radicular cyst more commonly involves anterior region of the maxilla, while in the mandible, the cyst is more common in the premolar region.[4] The incidence of radicular cyst in the anterior region of the maxilla is three times larger than the mandible since the anterior region of the maxilla is more susceptible to caries, trauma, pulp necroses due to growth abnormalities and the irritative effects of restorative materials.[5,6,7]

Most of radicular cysts are asymptomatic, particularly in the smaller cyst. Radicular cysts are usually discovered after radiology examination, except in some cases present with suppuration, which results in pain and other symptoms as well as swelling and tooth mobility.[8,9] Radiographic features of radicular cyst showed an osteolytic lesion, round or oval radiolucent area, unilocular, and a radiopaque well-defined lining that is associated with the root of the related tooth. Aspiration of the cyst could help in establishing the diagnosis of a larger cyst.[3,8] Treatment of choice for radicular cysts includes conventional non-surgical root canal treatment for localized and smaller lesions with a diameter of 1 cm to remove microbes from the root canal system, and surgical treatment such as enucleation, marsupialization, or decompression for larger cysts.[10,11]

METHODS

This case report obtained written consent from the patient. The consent provided encompassed permission for the publication of this case report, including documentation such as images and descriptions of the patient's condition.

A 63-year-old female patient came to RSGM Prof. Soedomo and presented with swelling measuring 2 cm in the gingival area of upper front teeth. The patient was aware of the swelling for around a year prior but did not feel any pain. There were no complaints of pain or soreness in the swollen area. History of drug allergy and systemic diseases were denied.

Radiological examination using a panoramic radiograph revealed a radiolucent area with well-defined radiopaque lining in the anterior region of the maxilla (root areas of 14, 13, 12, 11) and the

Figure 1. Panoramic radiograph

Figure 2. Clinical appearance of upper jaw from labial aspect

Figure 3. Clinical appearance of upper jaw from palatal aspect

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remaining roots of teeth 12 and 26. An aspiration biopsy of the swollen area was performed, then a pathological anatomy examination was carried out in Instalasi Laboratorium Klinik RSGM UGM Prof. Soedomo, number 2211290001. Pathological anatomy examination revealed that the cyst was filled with cholesterol crystal. The treatment plan for the patient was enucleation of the cyst and extraction of the related teeth.

Management of radicular cyst began with anesthetizing the patient. Then, the incision of flap was made from distolabial sulcus of tooth 21 to the distolabial sulcus of tooth 15, extending to the vestibule in trapezoid pattern. The flap was opened with raspatorium, followed by separation of the mucosa from the cyst capsule. After the cyst capsule was visible, the cyst capsule was completely detached and removed from the surrounding bone.After the entire capsule of the cyst had been removed, the cyst cavity was cleaned and the remaining bone were shaped and smoothed. Extraction of related teeth 11, 12, 13 were done and followed by suturing of the incision area using simple interrupted technique. Drainage using gauze immersed in 10% povidone-iodine for 5 minutes was applied inside the cyst cavity through a gap in the socket of tooth 13.

Follow-up check-ups were done on the first and second days post-surgery to reduce the drainage volume. The drainage was removed on the third day post-surgery. Clinical examination showed the wound healing progressed as expected; there was no bleeding and no complication occurred. Aff hecting was done after a week, and another follow-up check-up was conducted again 14 days post-surgery. Clinical examination 14 days post-surgery showed that the socket was already closed. A follow-up check-up was carried out 7 months post-surgery for clinical examination and panoramic radiology examination. The outcome showed that there was no swelling and no sign of infection.

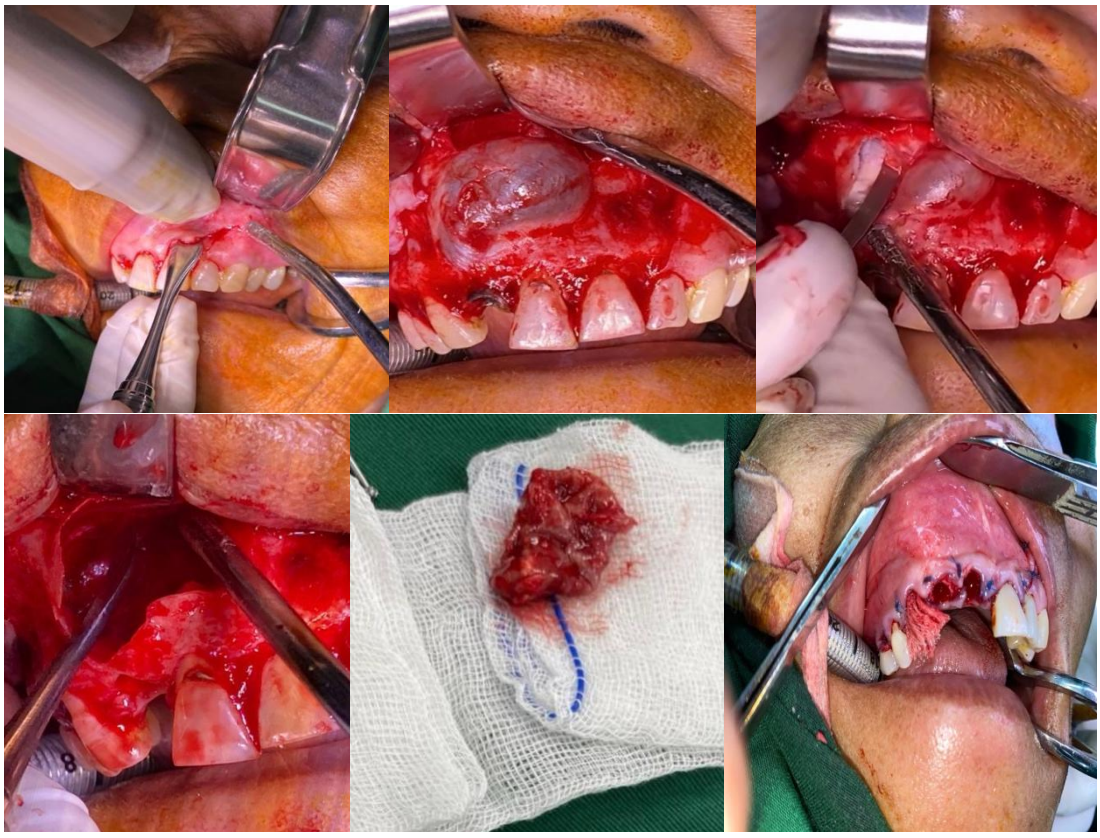

Figure 4. Enucleation process of the radicular cyst

Figure 5. Clinical examination on 14th day post-surgery

(A) (B)

Figure 6. Follow-up check-up 7 months post-surgery: (A) Panoramic radiography (B) Clinical examination

DISCUSSION

Radicular cysts are usually detected by clinical examination and radiology examination, which appear as osteolytic lesion, round or oval-shaped lesion with well-defined radiopaque lining.[8] Most of radicular cysts are located in the apex of related tooth. Some radicular cysts associated with lateral canal or accessory canal are found in lateral side of the root.[11] Radicular cyst is developed from chronically inflamed granulation tissue (periapical granuloma) in the root tip area of endodontically treated tooth or non-endodontic treated tooth with infected root canal.[12] Microorganism and their byproducts may spread to the root canal and through the apical foramen, resulting in inflammatory of periapical tissue and resorption of alveolar bone around the root of related tooth.[13] Radiology examination using panoramic imaging in this case showed radiolucent area with well-defined radiopaque lining, located in the root area of tooth 12 as the main cause of the formation of radicular cyst.

Most lesions of the jaw are developed from odontogenic epithelium and could be classified as inflammatory and developmental.[13] Radicular cyst is inflammatory lesion that develops from the cell rests of Malassez located in periodontal ligament.[14] The remnants of epithelial Malassez are stimulated by the chronic inflammatory conditions, causing the remaining necrotic tissue in the pulp to produce bacterial byproducts which develop into periapical granuloma, and result in epithelial proliferation. The formation of a semi-permeable epithelial layer allows fluid to penetrate into lumen through osmosis, causing the cyst to expand gradually and initiating the development of the cyst and progresses to cyst growth. The cyst usually contains cholesterol crystal and fibrous tissue. Aspiration of contents within the lesion is required to establish the diagnosis. Cysts with 1.5-

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2 cm in diameter can be subjected to aspiration biopsy.[8,13,15] Pathological anatomy examination in this case was performed by aspiration biopsy, which revealed the presence of cholesterol crystal within the cyst.

Management of radicular cyst in the maxilla is based on the size and location of the lesion, relation of the cyst with surrounding teeth and vital anatomy, such as alveolaris inferior canal, mental foramen, infraorbital foramen, maxillary sinus, nasal cavity.[16] Treatment options for radicular cyst include non-surgical endodontic treatment, followed by apicoectomy as a substitute of endodontic treatment with pathological condition in the periapical area.[3,17] Apicoectomy usually follows retrograde filling to seal the root canal ends in periapical area.[11,18]

Enucleation of radicular cyst was performed when the location of the cyst is not associated with surrounding vital anatomy. Marsupialization is mandatory on larger cysts to decompress the cysts, or combination of these techniques.[3,19] Enucleation of the cyst in this case was carried out by considering the location of the cyst that is not associated with surrounding vital structures such as maxillary sinus or nasal cavity.

Enucleation of the cyst was performed after the patient was anesthetized using general anesthesia. General anesthesia was done due to the large size of the cyst. Enucleation of the smaller cyst may be held with local anesthesia. On the contrary, larger cyst should be performed under general anesthesia. General anesthetics during surgery may block pain by dampening brain activity and promoting loss-of-consciousness [9, 20] The use of general anesthesia poses a greater risk in elderly patients, notably those over 65 years of age,[21] due to comorbidities that are contraindicated for this type of anesthesia. In this study, the patient was 63 years old; therefore, prevention of morbidity and mortality risks was mandatory and was done with complete subjective and objective examination of the patient prior to operative treatment. Complete examination of the patient revealed that there was no comorbidity, hence the use of general anesthesia for the surgery.[22]

Trapezoid flap incision was performed. Incision and reflection of the full-thickness flap are necessary to minimize bleeding and prevent tissue damage.[23] A study shows that a trapezoid flap is preferred (63.2%) rather than triangular flap (15.8%). Trapezoid flap is primely applied for surgery procedures that require wide access, particularly those that unreachable with triangular flap.[8] Two-dimensional-based panoramic imaging does not show a definite lining of the lesion; therefore, wider access is needed in order to perform complete removal of the lesion. Vertical incision of trapezoid flap is always extended to interdental papilla, not stopped in the middle of labial or buccal surface of the tooth, to ensure gingival integrity is well maintained and prevent the wound contraction after the wound heals. The base of the flap should be wider than the free gingival margin to obtain proper vascularization for the wound healing process.[8, 24] Clear access to the cyst capsule was obtained; then, complete cyst capsule removal was performed.

The bone cavity was examined to ensure that all the tissue had been removed after the complete removal of the cyst capsule was done. Irrigation and drainage using gauze, tissue curettage, and bone spicule refinement were performed prior to primary wound closure. A bone clot will fill the bone cavity concomitantly.[23,25] Gauze placement was done in order to eliminate fluid, such as blood, serum and inflammatory mediator. Gauze placement aims to prevent the accumulation of fluid (blood, pus, and infected fluid), prevent accumulation of gas (dead space) inside the cyst cavity, reduce pressure in the surgical area and surrounding organ including nerve and blood vessel, and increase the wound perfusion and wound healing in order to minimize pain.[26] Passive and open drain using gauze drain was applied for the patient. Volume of gauze drain was reduced from the 1st to the 3rd days post-surgery in order to minimize gas accumulation (death space).

In this study, management of radicular cyst using enucleation technique accompanied by extraction of related teeth was performed due to the large size of the lesion, and the location of the cyst that was not associated with vital structures such as

maxillary sinus membrane, infraorbital foramen, and nasal cavity. Enucleation or complete removal of the cyst can cause damage to vital structure located near the cyst. However, enucleation technique may prevent the lesion from recurring, and the removed tissue can be sent for histopathological examination.[3] Radiography examination revealed that new bone formation required 6-12 months to cover the bone cavity. The enlarged jaw due to the cyst gradually reshaped to become more normal.[23]

CONCLUSION

Radicular cyst treatment in maxillary area has been performed with enucleation technique using general anesthesia. Enucleation technique was determined based on several factors, including extension of the lesion that was not associated with vital structures, specifically maxillary sinus and nasal cavity. The patient was anesthetized using general anesthesia due to the large size of the cyst, which measured 2 cm in diameter. History of medical health showed no comorbidity. The cyst was evaluated through enucleation by ensuring that the bone cavity was clean with no remains of pathological tissue, irrigation and curettage of the whole cavity bone, refinement of bone spicule, primary wound closure and application of drain and follow-up periodically. Clinical examination 7 months post-surgery showed no recurrence or complications.

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CONFLICT OF INTEREST

The authors declare no conflict of interest with the data contained in the manuscript.

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