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Email : editorijhess@gmail.com

Radicular Cyst: A Review Of The Clinical, Radiographic, And Management Features

Dyah Ajeng Ramadhani[1)*], Ichda Nabiela Amiria Asykarie[2)]
[1,2)] Fakultas Kedokteran Gigi dan Universitas Muhammadiyah Surakarta

*Corresponding Author
Email : dyahajengrrr@gmail.com

Abstract

Radicular cyst is the most common inflammatory odontogenic cyst found in the jaws and is generally associated with pulp necrosis due to chronic infection. This lesion often develops asymptomatically and is frequently detected incidentally during radiographic examination. This study aims to review the clinical features, radiographic characteristics, and management of radicular cysts based on a systematic literature review. The method used was a Systematic Literature Review by collecting data from various relevant scientific databases. The results indicate that clinically, radicular cysts are mostly asymptomatic in the early stages, but in advanced conditions, they may cause swelling, pain, and bone expansion. Radiographically, the lesion typically appears as a well-defined radiolucent area at the apex of a non-vital tooth; however, definitive diagnosis still requires histopathological examination. Advanced imaging modalities such as CBCT and MRI improve diagnostic accuracy. The management of radicular cysts depends on the size and characteristics of the lesion. Non-surgical endodontic treatment is the primary approach for small to moderate lesions, while surgical interventions such as enucleation or marsupialization are indicated in more complex cases. In conclusion, a comprehensive approach involving clinical, radiographic, and histopathological evaluation is essential for accurate diagnosis and effective management of radicular cysts.

Keywords: ***Radicular Cyst, Clinical Features, Radiographic Features, Management, Periapical, CBCT***

INTRODUCTION

Radicular cyst is one of the most common types of odontogenic cysts encountered in dental practice, particularly associated with chronic inflammatory processes in the periapical tissue(Fitriana et al., 2022). This lesion generally develops as a result of untreated pulp necrosis, which triggers a prolonged inflammatory response (Yuanita, 2020). This process stimulates the proliferation of epithelial remnants of Malassez in the periodontal ligament, which then forms a pathological fluid-filled cavity. Although in the early stages radicular cysts are often asymptomatic, progressive lesion development can cause damage to surrounding hard and soft tissues (Zubardiah, 2024).

Clinically, radicular cysts are often found without symptoms and are frequently detected incidentally during routine radiographic examinations. However, in certain conditions, patients may present signs such as swelling, mild to moderate pain, tooth discoloration, and the presence of a fistula in cases of secondary infection (Amalia & Putri, 2026). Therefore, understanding the clinical features is important for dentists to support accurate diagnosis. In addition, radiographic examination plays a crucial role in identifying this lesion, where radicular cysts typically appear as well-defined radiolucent areas around the apex of non-vital teeth. These radiographic characteristics help distinguish radicular cysts from other periapical lesions (Fauziah et al., 2024).

The management of radicular cysts depends on several factors, such as cyst size, location, and the condition of the involved tooth. Therapeutic approaches may include conventional endodontic treatment for small lesions, or surgical procedures such as enucleation or marsupialization for larger lesions. The appropriate selection of management methods is essential to completely eliminate the lesion while preserving the function and structure of surrounding tissues (Katrini et al., 2024).

Based on the above description, the issues in this review focus on the clinical presentation of radicular cysts, their radiographic characteristics in supporting diagnosis, and appropriate management based on patient clinical conditions. Accordingly, the purpose of this literature review is to describe the clinical features of radicular cysts, identify their characteristic radiographic appearances, and review effective management methods based on relevant scientific sources.

RESEARCH METHODS

This study uses the Systematic Literature Review (SLR) method, which is a systematic, structured, and comprehensive approach to identify, evaluate, and synthesize relevant research findings related to radicular cysts, particularly concerning clinical features, radiographic appearance, and management (Asriadi, 2025). he literature search was conducted through several electronic databases, such as PubMed, Google Scholar, ScienceDirect, and Wiley Online Library. The search used keywords adapted to the research topic, including "radicular cyst," "clinical features of radicular cyst," "radiographic appearance of radicular cyst," and "management of radicular cyst," either individually or in combination using Boolean operators (AND, OR) (Mahyuni, 2021).

he inclusion criteria in this study consisted of scientific articles published within a specified time frame (e.g., the last 10 years), available in full text, written in English or Indonesian, and directly discussing radicular cysts in terms of clinical, radiographic, and/or management aspects. Meanwhile, the exclusion criteria included irrelevant articles, articles without full text availability, opinion or editorial papers, and studies with unclear or unreliable data..

The article selection process was carried out in several stages, namely identification, screening, eligibility, and inclusion. In the identification stage, all articles obtained from the search were collected. Screening was then performed based on titles and abstracts to assess relevance to the research topic. Eligible articles were further evaluated in depth by reading the full text. Articles that met all inclusion criteria were included in the final stage, namely analysis (Utami et al., 2021).

Data from the selected articles were then extracted and analyzed qualitatively. The information collected included study characteristics, clinical features of radicular cysts, radiographic findings, and management methods used. The results were synthesized to provide a comprehensive overview of the topic. By using the Systematic Literature Review method, this study is expected to produce valid, reliable, and evidence-based scientific information regarding radicular cysts.

RESULTS AND DISCUSSION

Table 1. Literature Review of Previous Studies

No	Title	Author	Year	Main Findings
1	Clinical and histopathological pattern of radicular cysts: a retrospective study	Kiyani et al.	2025	Radicular cysts commonly occur in patients under 40 years old, predominantly in the anterior maxilla, are usually asymptomatic, and radiographically appear as unilocular radiolucency at the apex of non-vital teeth. Histopathology shows non-keratinized stratified squamous epithelium with chronic inflammation (Kiyani et al., 2025).
2	Decision Analysis on Management of Periapical Cyst	Senthilkumar et al.	2021	Most radicular cysts are asymptomatic and detected radiographically. The main treatment is non-surgical (endodontic therapy), while surgery is indicated if conservative treatment fails (Senthilkumar et al., 2021).
3	Management of periapical cyst (radicular cyst): A non-surgical endodontic approach	Shelke et al.	2022	Radiographically appears as a well-defined radiolucency at the apex. Non-surgical treatment using irrigation and calcium hydroxide is effective in promoting healing without clinical symptoms (Shelke et al., 2022).
4	Differentiation of radicular cysts and granulomas via CT texture analysis	Yomtako et al.	2024	Conventional radiography has limitations in differentiating radicular cysts from granulomas, while CT and texture analysis improve diagnostic accuracy (Yomtako et al., 2024).

5	Endodontic surgery apicoectomy of radicular cyst	Djaynurdin et al.	2021	Management combines non-surgical and surgical approaches (apicoectomy). Surgery is performed when retreatment shows no improvement, with radiographic evidence of lesion healing (Djaynurdin et al., 2021).
6	Biological mechanisms underlying radicular cyst formation: systematic review	Ríos-Osorio et al.	2026	Cyst formation is triggered by epithelial proliferation due to chronic inflammation involving cytokines and growth factors, which is essential for understanding disease progression and treatment options (Ríos-Osorio et al., 2026).
7	Surgical-Endodontic Management of Periapical Cyst	Herrera & Castro	2025	Radicular cysts are often asymptomatic and slow-growing. Combined endodontic and surgical treatment (enucleation/curettage) shows high success rates in healing (Herrera & Castro, 2025).
8	Rapidly Progressing Radicular Cyst in an Endodontically Treated Tooth	Asgary & Shamloo	2025	Cysts may progress rapidly with mild pain. CBCT provides higher diagnostic accuracy than conventional radiography. Surgical cystectomy is effective in preserving tooth function (Asgary & Shamloo, 2025).
9	Differential diagnosis between granuloma and radicular cyst using MRI	Lizio et al.	2018	MRI offers higher accuracy in differentiating cysts from granulomas compared to conventional radiography, while definitive diagnosis requires histopathology (Lizio et al., 2018).
10	The Development of Large Radicular Cysts in Maxillary Teeth	Cohen et al.	2021	Large cysts (>15 mm) are frequently associated with previously endodontically treated teeth and may cause bone destruction and maxillary sinus involvement (Cohen et al., 2021).

Discussion

Radicular cyst is the most common inflammatory cystic lesion found in the jaws and is closely associated with pulpal infection and chronic inflammatory processes in periapical tissues. Based on the literature review, the discussion is focused on three main aspects: clinical features, radiographic characteristics, and management.

Clinically, radicular cysts usually develop slowly and are often asymptomatic in the early stages. Many cases are incidentally discovered during routine radiographic examinations. This is supported by studies showing that most radicular cysts are asymptomatic, although in certain conditions they may present swelling, pain, or fistula formation due to secondary infection (Herrera & Castro, 2025). Radicular cysts are more commonly found in the maxilla, particularly in the anterior region, with the lateral incisor being the most frequently involved tooth (Cohen et al., 2021). Larger lesions may cause bone expansion, involvement of adjacent anatomical structures such as the maxillary sinus, and more evident clinical symptoms. Studies also indicate that large cysts are more frequently associated with previously endodontically treated teeth and tend to present more pronounced clinical manifestations (Cohen et al., 2021).

From a radiographic perspective, radicular cysts typically appear as well-defined radiolucent lesions at the apex of non-vital teeth. However, radiographic diagnosis alone cannot reliably differentiate radicular cysts from periapical granulomas due to their similar appearance. Therefore, definitive diagnosis often requires histopathological examination (Lizio et al., 2018). Advances in imaging technology such as Cone Beam Computed Tomography (CBCT) and Magnetic Resonance Imaging (MRI) have improved diagnostic accuracy. CBCT provides three-dimensional visualization of lesion size, borders, and involvement of surrounding structures, even in cases not visible on conventional radiographs (Asgary & Shamloo, 2025). Meanwhile, MRI is effective in distinguishing cystic from non-cystic tissues, supporting non-invasive diagnosis (Lizio et al., 2018).

In terms of management, treatment approaches depend on lesion size, tooth condition, and response to initial therapy. For small to moderate lesions, non-surgical endodontic treatment is the

primary option as it eliminates the source of infection and promotes periapical healing. However, in cases of large cysts, lesions unresponsive to conservative therapy, or true cysts, surgical intervention such as enucleation, marsupialization, or apicoectomy may be required (Asgary & Shamloo, 2025). A combination of endodontic and surgical treatment has shown high success rates in eliminating lesions while preserving the affected teeth (Herrera & Castro, 2025). Treatment selection is also influenced by lesion size and involvement of surrounding anatomical structures (Cohen et al., 2021).

In addition, understanding the pathogenesis is important in explaining radicular cyst development. Cyst formation is influenced by the proliferation of epithelial remnants of Malassez triggered by chronic inflammation, involving mediators such as pro-inflammatory cytokines and growth factors (Ríos-Osorio et al., 2026). This mechanism explains the transformation of periapical granulomas into radicular cysts and why not all periapical lesions progress into cysts.

Overall, the literature review indicates that the diagnosis and management of radicular cysts require a comprehensive approach, including clinical, radiographic, and histopathological evaluation. The use of advanced imaging technologies such as CBCT and MRI improves diagnostic accuracy, while treatment selection must be tailored to patient conditions to achieve optimal outcomes.

CONCLUSION

Based on the literature review on radicular cysts, it can be concluded that the clinical presentation is generally asymptomatic in the early stages and is often incidentally discovered during radiographic examinations. However, in advanced conditions, the lesion may cause symptoms such as swelling, pain, and disruption of surrounding tissue structures, especially when the cyst increases in size.

From a radiographic perspective, radicular cysts typically appear as well-defined radiolucent lesions at the apex of non-vital teeth. Nevertheless, conventional radiographic examination has limitations in differentiating radicular cysts from other periapical lesions such as granulomas. Therefore, further diagnostic imaging such as CBCT or MRI is required to improve diagnostic accuracy, along with histopathological confirmation.

In terms of management, treatment approaches depend on the size and characteristics of the lesion. Non-surgical endodontic treatment is the primary choice for small to moderate lesions, while surgical interventions such as enucleation, marsupialization, or apicoectomy are indicated for larger or non-responsive cases. A combination of non-surgical and surgical approaches has been shown to provide optimal outcomes in eliminating the lesion and preserving tooth function. Thus, the management of radicular cysts requires a comprehensive and evidence-based approach, including clinical, radiographic, and histopathological evaluation to achieve accurate diagnosis and successful treatment outcomes.

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