

Clinicopathological Study of 72 Periapical Lesions from Vietnamese Patients

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Abstract

OBJECTIVES: This retrospective study evaluated the clinical and histopathological features of 72 periapical lesions in Vietnamese patients.

MATERIALS AND METHODS: Seventy-two periapical lesions obtained from 72 patients after periapical surgery due to unsuccessful root canal retreatment of anterior teeth were histologically analyzed and classified as periapical granulomas, periapical cysts, and periapical scars. The demographic data: patient's age, gender, and lesion sites were also recorded.

RESULTS: The mean age was 34.74 years, with a range from 12-65. Of these lesions, 53 cases were found in the maxilla and 19 cases in the mandible. The lesions occurred more frequently in the third to fourth decade of life and the most involved tooth was the lateral incisor. Periapical granulomas accounted for 45 cases (62.5%), followed by periapical cysts with 27 cases (37.5%). Of the 27 periapical cysts, 96.3% of the cases were lined with stratified squamous epithelium and the remaining with respiratory epithelium. The prevalence of cholesterol clefts, foamy histocytes, and dystrophic calcification in the periapical cyst was 22.2%, 29.6%, 25.7%, and 8.8%, 11.1%, 51.1% in the periapical granuloma, respectively. One periapical cyst contained a foreign body (3.7%). Only two periapical granulomas demonstrated mixed acute and chronic inflammation.

CONCLUSION: All cases were identified as benign lesions with the most common type being periapical granuloma. The data of this study also confirms the importance of histological examination to establish an accurate diagnosis to eradicate a malignant lesion that may be present in the periapical region of teeth.

Keywords: periapical lesion, histopathology, periapical surgery, anterior teeth

Apical periodontitis is an inflammatory process that results in the destruction of the periapical tissue surrounding the tooth root. This condition is usually the sequelae of pulp disease, such as pulp inflammation or necrosis that may result from dental trauma, caries, or failed dental treatments.^{1,2} Due to its asymptomatic nature, this pathological condition is typically detected during routine dental examination and is initially managed by root canal treatment. However, many benign and malignant lesions, such as nasopalatine duct cysts, adenomatoid odontogenic tumors, squamous cell carcinoma, or breast carcinoma metastasis, are initially misdiagnosed as a periapical lesion of pulp origin.³ When there are no signs or symptoms in the inflammation area, this lesion requires further histopathological investigation to obtain a definitive diagnosis, especially lesions that do not respond to endodontic treatment or root canal retreatment.^{1,4}

To the best of our knowledge, there are few comprehensive reports on the clinical and histopathological aspects of apical periodontitis in Vietnam. The purpose of this study was to investigate the demographic information and histopathological diagnoses of the periapical lesions obtained from unsuccessful root canal re-treatment of anterior teeth in Vietnamese patients. The data obtained from this study indicate that dentists must strictly adhere to root canal treatment protocols and that surgeons should strongly consider submitting lesion specimens for histopathological evaluation to obtain a definitive diagnosis.

Material and Methods

The study protocol was approved by the Ethics Committee for Research of the National Hospital of Odonto-Stomatology (NHOS), Hanoi, Vietnam (No. 01/

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Received: January 20, 2020
Revision received: March 18, 2020
Accepted after revision: May 29, 2020
BKK Med J 2020;16(2): 130-135.
DOI: 10.31524/bkkmedj.2020.21.004
www.bangkokmedjournal.com

HDDD-BVRHMTWHN). In this retrospective study, seventy-two patients with 72 periapical lesions located at the upper and lower anterior teeth were referred from the Department of Endodontics to the Department of Minor Oral Surgery for apical surgery due to a large, unresolved periapical lesion after root canal re-treatment. The study was conducted between October 2014 and February 2018. The patients were treated following the England Society of Endodontic guidelines for apical surgery.⁵ The patients were informed about the study details and signed consent forms before participating in the study. The demographic data, including the patient's age, sex, and lesion site, were recorded.

Surgical procedure

The surgical procedures were performed as previously described.⁶ Briefly, the patients were treated under local anesthesia. A full thickness flap was reflected, and minimal cortical bone was removed to access the periapical lesion. The infectious tissue surrounding the apex was removed and submitted for microscopic examination. The root was resected 3 mm from the apex perpendicular to the long axis of the tooth and a retrograde cavity was made using ultrasonic tips. The prepared root face was filled with MTA. The flap was replaced and sutured. The patients were provided postoperative instructions and appointed to have a clinical examination and suture removal a week later.

Tissue processing

The specimens obtained during the operation were immediately fixed in 10% neutral formalin solution for 24 hour (h) at 4°C with a specimen/fixative volume ratio of 1:10. These samples were dehydrated in graded alcohol and embedded in paraffin. Serial 5 µm sections were made using a rotary microtome and stained with hematoxylin and eosin⁷.

Histologic analysis

The histological sections were examined using a microscope by an oral pathologist and were reexamined after one week. The specimens were categorized into periapical cysts, periapical

granulomas, or periapical scars, according to a previous study.⁸ A diagnosis of a periapical cyst was based on the presence of epithelium completely or partly lining the cavity, and evidence of fibrous connective tissue. The epithelial layer was divided into stratified squamous and respiratory types. A lesion was diagnosed as a periapical granuloma when granulation tissue was present with or without epithelial layers. A periapical scar was diagnosed by the presence of a dense, collagenous connective tissue and a lack of inflammatory cells.

Additional lesion components were also recorded: cholesterol clefts, foamy histiocytes, dystrophic calcification, or foreign bodies. A mixed type of inflammation was determined when chronic and acute inflammatory cells were both present. The level of chronic inflammation was categorized into mild, moderate, or severe types with less than 25%, from 25–50%, and greater than 50% inflammatory cell infiltration, respectively.⁸ Figure 1D and 2A illustrate the representative image of moderate and severe states, respectively.

Results

The study comprised 72 biopsy samples from 72 patients with a female to male ratio of 1.7:1 and a mean age of 34.74 years (range 12–65). Periapical granuloma was the most commonly diagnosed lesion with 45 cases (62.5%), while periapical cysts constituted 27 cases (37.5%). No periapical scars were found. The intra-correlation agreement was 0.91. The distribution of the periapical lesions by age indicated that they were commonly found in patients from the third to fifth decades of life. The prevalence of a periapical granuloma by age groups was highest in patients 20–29 years-old with 16 cases (35.55%). These lesions infrequently occurred in patients 10–19 and 60–69 years-old with only 3 (6.7%) and 2 cases (4.7%), respectively. A periapical cyst was most commonly observed in patients 30–39 years-old with 10 cases (37.03%). No periapical cysts were diagnosed in those 50–59 years-old. We evaluated the lesion location and found that significantly more biopsy samples were derived from the maxilla with 53 cases (73.61%) compared with from the mandible with 19 cases (26.39%) (Table 1).

Table 1: The Characteristics of the patients (n = 72)

	Periapical cyst	Periapical granuloma	Periapical scar
n	27(37.50)	45 (62.50)	0
Sex			
Male	11 (15.28)	16 (22.22)	0
Female	16 (22.22)	30 (41.67)	0
Age group (years)			
10 - 19	6 (22.22)	3 (6.7)	0
20 - 29	3 (11.11)	16 (35.55)	0
30 - 39	10 (37.03)	8 (17.77)	0
40 - 49	7 (25.92)	8 (17.77)	0
50 - 59	0	8 (17.77)	0
60 - 69	1 (3.72)	2 (4.44)	0
Lesions Site (Jaw Type)			
Maxilla	21 (29.17)	32 (44.44)	0
Mandible	6 (8.33)	13 (18.06)	0

The most frequent site for these lesions was the maxillary central and lateral incisors, followed by the mandibular lateral incisors (Table 2).

Of the 27 periapical cysts, a stratified squamous epithelial lining was identified in 96.3% of cases, and the remaining cysts were lined by respiratory epithelium (Figure 1). The prevalence of cholesterol clefts and foamy histiocytes in the periapical cysts was 2.5- and 2.6- fold greater, respectively, than that of periapical granulomas. In contrast, dystrophic

calcification in the periapical granulomas was 2-fold higher compared with periapical cysts. Only 1 (3.7%) periapical cyst was found with foreign bodies. When evaluated for inflammation, mixed acute and chronic inflammation was noted in 2 (4.4%) periapical granulomas (Figure 2). In the periapical granulomas, mild chronic inflammation accounted for 48.8%, followed by moderate (33.3%), and severe (17.9%) chronic inflammation. In the periapical cysts, the highest percentage of chronic inflammation was moderate, followed by severe and mild status (Table 3).

Table 2: The distribution of the 72 periapical lesions by tooth type (n = 114*).

Site	Periapical granuloma		Periapical cyst	
	Maxilla	Mandible	Maxilla	Mandible
Central incisor	24	8	11	5
Lateral incisor	25	8	11	5
Canine	4	5	6	2
Total	53	21	28	12

Table 3 : Histopathological features of the periapical lesions associated with failed endodontic re-treatment.

Histopathological features	Periapical granuloma n = 45 (100%)	Periapical cyst n = 27 (100%)
Lining epithelium		
Stratified squamous	0	26 (96.3%)
Respiratory type	0	1 (3.7%)
Cholesterol clefts	4 (8.8%)	6 (22.2%)
Foamy histiocytes	5 (11.1%)	8 (29.6%)
Dystrophic calcification	23 (51.1%)	7 (25.9%)
Foreign bodies	0	1 (3.7%)
Mixed acute and chronic inflammation	2 (4.4 %)	0
Chronic inflammation		
Mild	22 (48.8%)	2 (7.4%)
Moderate	15 (33.3%)	16 (59.3%)
Severe	8 (17.9%)	9 (33.3%)

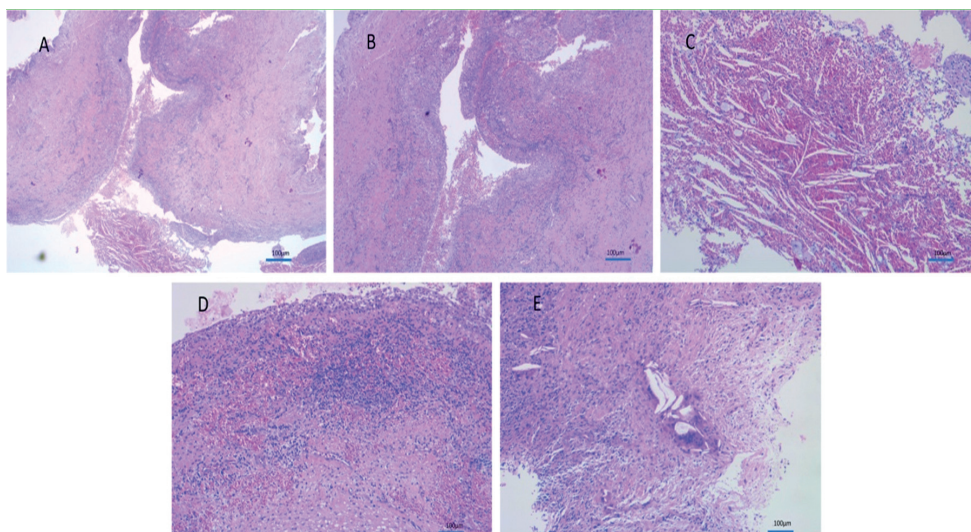


Figure 1: Histopathological features of a periapical cyst. (Hematoxylin and eosin stain; A= 2.5x; B= 4x; C-E= 10x).
A: A low-power view of a periapical cyst lined by stratified squamous epithelium.
B: Higher- power view of the stratified squamous epithelium. **C:** Cholesterol clefts with foamy histiocytes.
D: Moderate chronic inflammatory cells in the periapical cyst. **E:** Foreign bodies surrounded by multinucleated foreign body giant cells.

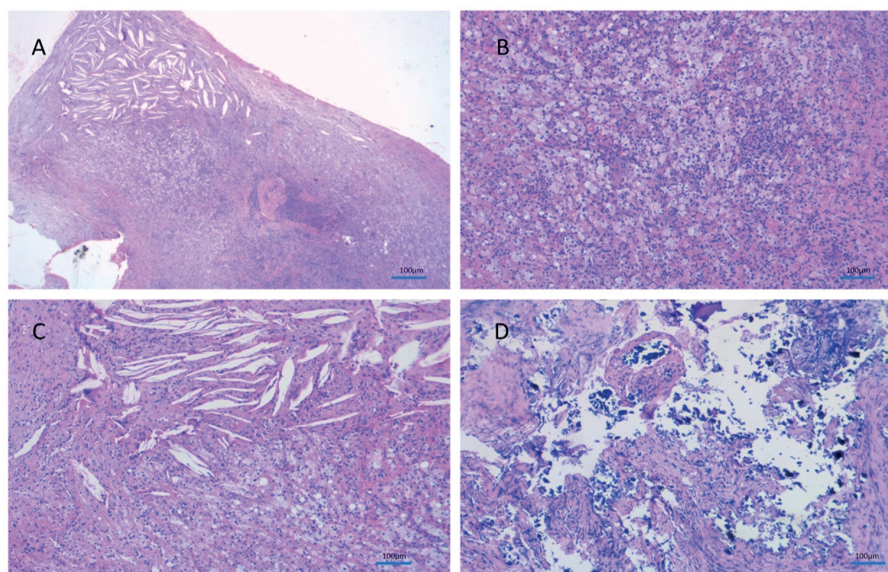


Figure 2: Histopathological features of a periapical granuloma (Hematoxylin and eosin stain: A=2.5x; B-D=10x). **A:** A periapical granuloma composed of granulation tissue with a severe inflammation. **B:** High power view of (A) showing an aggregation of foamy histiocytes in a periapical granuloma. **C:** Cholesterol clefts and multinucleated foreign body giant cells. **D:** Dystrophic calcification.

Discussion

This study investigated the clinical-pathologic presentations of periapical lesions at the anterior teeth. Our results demonstrated that females were more likely to have a periapical lesion, comprising 64% of the biopsy samples. This finding concurs with those of other reports.^{7,9} The mean age (34.74 years old) of patients with periapical lesions in this study was similar to a previous study¹⁰ but differed from that of another study.⁷ The present study found a peak incidence in the fourth decade of life, which agreed with two other studies^{11,12} but differed from the third decade found by Akinyamoku et al.⁹ The possible explanations are Vietnamese female had a higher prevalence of periodontal disease than males, and the patient aged over 35 years old had more dental diseases than those aged under 35 years.¹³

A study by Carrillo et al.¹⁴ found that most of the periapical lesions were in the anterior maxilla. These findings are in line with the results of our study, where the ratio of periapical lesions in the anterior maxilla to the anterior mandible was 3.2:1. An explanation for the predominance of the lesions in the anterior maxilla may be due to the morphology and location of the anterior teeth. The upper anterior teeth are prone to be traumatized following accidents.^{15,16}

Periapical granulomas and periapical cysts are the most common type of periapical lesion. However, the incidence of two these lesions varies in the literature, with the prevalence of periapical granulomas ranging from 9% to 87%, and that of periapical cysts ranging from 7% to 59%.¹⁷⁻²⁰ Our study found a higher prevalence of periapical granulomas (73.61%) than periapical cysts (26.39%). These findings were in agreement with other studies but differed from studies that

found periapical cysts as the predominant type.^{8,9,11,20,21} Several studies stated that the discrepancy in the literature may be due to differences in diagnostic criteria.^{14,21,22} Moreover, a lack of serial sections or step-serial sectioning of the histological samples and samples without a cut root apex might lead to an incorrect periapical cyst classification.¹⁴

The frequency of ciliated epithelium-lined periapical cyst varies from 0.8% to 10%.²³ In the present study, respiratory epithelium was identified in one periapical cyst (3.7%) collected from upper anterior teeth. The close anatomic proximity of the inflammatory lesion to the nasal cavity may explain the presence of respiratory epithelium cells.²³

Cholesterol clefts were found in 10 (13.88%) cases, of which 4 (8.8%) were periapical granulomas and 6 (22.2%) were periapical cysts. This incidence was comparable to that (11.7%) of a previous study,⁸ but lower compared with another study²⁴ that reported that the frequency of cholesterol crystals in periapical lesions varied from 18–44%. It was also demonstrated that the presence of a cholesterol cleft in a periapical lesion prevented healing of these lesions because root canal treatment or retreatment cannot eliminate these materials.² Dystrophic calcification and foamy histiocytes were present in 30 cases (57%) and in 13 cases (40.7%), respectively, which was more frequent compared with other studies.^{8,25}

We identified foreign bodies in one (3.7%) periapical cyst lesion case, which was higher than that of 0.4% reported by Stockdale and Chandler,¹² but lower than other reports.^{1,8} The origin of foreign bodies in the present study came from root

canal filling materials, which was in agreement with the two previous studies.^{8,25}

In the present study, only two cases (4.4%) of periapical granuloma were diagnosed with mixed acute and chronic inflammation, a much lower frequency than that reported by Lin et al.⁸ No mixed acute and chronic inflammation was found in a periapical cyst, which was in contrast to the results in Lin et al.⁸ and Chen et al.²⁵ Regarding biopsy samples exhibiting chronic inflammation only, the incidence of chronic inflammation in the periapical granulomas was highest with mild chronic inflammation, followed by moderate and severe inflammation, which was in contrast to Lin et al.⁸ who found that moderate inflammation was the most frequent, followed by severe and mild inflammation. In periapical cysts, moderate inflammation was the most common, followed by severe and mild inflammation, with a similar frequency of cases as reported by Lin et al.,⁸ but differed with Chen et al.²⁵

Conclusion

The histopathologic analysis of the 72 periapical lesion specimens collected from the anterior teeth demonstrated that

the most common type was periapical granuloma, followed by periapical cyst. Periapical lesions occur more frequently in female patients and in those in the third to fifth decades of life. These lesions were found more frequently in the maxilla, and the most frequently involved teeth were maxillary central incisors. These findings suggested the importance of specimen submission obtained from periapical surgery for histopathological evaluation to obtain an accurate diagnosis of the periapical lesion.

Conflict of interest

All authors declare that they have no conflict of interest.

Acknowledgements

We would like to thank Professor Dr. Visaka Limwong, Associate Professor Dr. Dolly Methatharatip, Dr. Kevin Tompkins for their valuable suggestions. This project was supported by Ratchadaphisek somphot Fund, Chulalongkorn University, Thailand.

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