

Clinical Signs as a Guide for the Diagnosis of Periapical Pathologies: A Random Population Study among the Patients of Central India

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ABSTRACT

Background: Significance of clinical signs as a sequel of pulpal pathosis and diagnosing of periapical pathology, also with each variant of periapical pathology.

Materials and methods: A total of 1522 subjects were examined for the presence of tooth related, pulp based clinical signs and symptoms and later subjected to periapical radiography. All the data were entered into Microsoft Excel and analyzed using Chi-square test (SPSS, 16.0) setting a value of $p < 0.05$ for significance of clinical signs of pulp involvement and diagnosing of every variant of periapical pathology and use of Z-test (SPSS, 16.0) setting a value of $p < 0.05$ to see the significance of periapical radiography to find the prevalence of periapical pathology and significance of these clinical signs with each variant of periapical pathology.

Results: In total, 1522 patients were examined and 1323 intraoral periapical radiographs were diagnosed with periapical pathology, where 87% of the patients had radiographic findings, giving a prevalence of 86.93%. Widening of periodontal ligament space was most prevalent and present in almost every fourth radiograph. About 13% of the radiographs did not show any periapical changes. On comparing the clinical findings with periapical radiographs, clinical signs were significant with the various radiographic diagnoses.

Conclusion: The result of present study shows a high significance to various signs of pulp associated pathologies in diagnosing inflammatory periapical lesions. Further studies are suggested using a better and accurate imaging modality like CBCT for better understanding of these pathologies.

Keywords: Periapical pathologies, central India, population study.

INTRODUCTION

Main causes of emergency care in dental practices are due to the Pathologies of endodontic, due to their painful symptoms. Pulp is prone to suffer

injuries due to the existence of various etiologies for the appearance of endodontic diseases, such as mechanical, thermal, electrical and chemical irritants,

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traumatic injuries and periodontal problems. Pulp tissue, when injured can advance towards the periapical area of the tooth, through the apical foramen to cause periapical pathology. Epidemiological studies report that dental caries is the most frequent etiological factor for the appearance of pulp disease.¹ Studies revealed that, 78% of periapical lesions are the result of an infectious or inflammatory process, usually due to pulpal disease².

Intraoral radiography is most frequently used to evaluate for carious and periapical disease. It has high spatial resolution and provides comprehensive anatomy of the tooth and surrounding bone.³

Periapical abscess, granuloma and cyst represent a spectrum of the same pathologic process. The radiographic features comprise a lucent halo surrounding the root apex, often with carious tooth. Ill-defined borders classically suggest an acute process, particularly when accompanied by pain, while sharply defined borders are suggestive of a chronic process. A periapical granuloma is a relatively small lucent lesion with ill-defined borders, whereas a periapical cyst is typically larger.⁴ Inflammatory changes present in the bone marrow and adjacent soft tissues strongly suggests periapical abscess. Fistula formation to adjacent soft tissues can occur and result in extra osseous abscess formation.³

Periapical cysts appear as round or pear-shaped, well defined radiolucent lesions with sclerotic borders. Periapical lucency larger than 200 mm³ on radiographs is characterized as a cyst.⁵ Periradicular pathology represents an inflammatory process which involves the apical periodontium without any predominance to any race or gender. Various studies have been conducted on the prevalence of these periapical pathologies based exclusively on biopsies which are confined to surgical material. The signs and symptoms to diagnose periapical pathologies clinically have been reported by many authors but statistical significance for the same has been reported by very few studies.

The questions of the prevalence of periapical pathologies in the general population are still unanswered as they represent a selected population. The accurate prevalence of periapical pathologies can be determined by obtaining

intraoral periapical radiographs in a random population instead of selected population. So, the present study was conducted to find the significance of clinical signs as a sequel of pulpal pathosis and diagnosing of periapical pathology, Also the use of periapical radiography to find the prevalence of periapical pathology and significance of these clinical signs with each variant of periapical pathology.

MATERIALS AND METHODS

Patients attending the outpatient Department of Oral medicine and radiology, Peoples College of dental sciences and research centre, Bhanpur, Bhopal, Madhya Pradesh State, India with the complaint of dental pain were examined for the presence of tooth related, pulp based clinical signs and symptoms and later subjected to periapical radiography. The patients with mixed dentition period and periodontal problems were excluded. A total of 1522 subjects were examined based on pre-determined clinical criteria. Approval for the project was obtained from institutional ethical committee. The clinical data were recorded in a specific clinical form developed with patients' age, gender, tooth involved, color, depth of the cavity, pulpal involvement, erythema at root apex, extraoral and/or intraoral swelling, sinus tract, tenderness on vertical percussion of tooth, vestibular tenderness on palpation at tooth apex and vitality of the tooth. Intra oral examinations were performed by dentists previously trained through visual inspection and palpation of teeth and their periapical regions. After recording the clinical data, intraoral periapical radiographs for the tooth involved were made. All the intraoral periapical radiographs were made by bisecting angle technique using IOPA machine with 70 kvp, 8 Ma and 12 inch cone, Kodak Carestream E-Speed X Ray films and Snap-A-Ray film holders. The radiographs were interpreted together by two oral radiologists based on Step-by-step guide suggested by Eric Whaites.⁶

All the data were entered into Microsoft Excel and analyzed using Chi-square test (SPSS, 16.0) setting a value of $p < 0.05$ for significance of clinical signs of pulp involvement and diagnosing of every variant of periapical pathology and use of Z-test (SPSS, 16.0) setting a value of $p < 0.05$ to see the significance of periapical radiography to find the prevalence of

periapical pathology and significance of these clinical signs with each variant of periapical pathology.

RESULTS

In total, 1522 patients were examined and 1323 intraoral periapical radiographs were diagnosed with periapical pathology, where 87% of the patients had radiographic findings, giving a prevalence of 86.93%. Widening of periodontal ligament space was most prevalent and present in almost every fourth radiograph (24.9%) followed by rarefying osteitis (23.9%), Periapical granuloma (11.9%), Infected periapical cyst (10.7%), Condensing osteitis (10.1%), and less prevalent was Periapical cyst (5.5%). About 13% of the radiographs did not show any periapical changes. (Table 1).

Majority of the patients belonged to 16 to 25 years age group. There was no sex predilection in distribution of clinical lesions ($p = 0.10$) (Graph 1) or periapical pathology ($p = 0.056$) (Graph 2). Mandibular molars (24%) were the most common and maxillary canines (0.81%) were the least common sites to involve with periapical pathology ($p = 0.00$).

On comparing the clinical findings with periapical radiographs, Extraoral swelling was significant with radiographic diagnosis of Rarefying osteitis, Periapical granuloma and Infected periapical cyst ($p=0.01$, $p=0.00$, $p=0.01$). Intraoral swelling was significant with Widening of periodontal ligament space, Rarefying osteitis, Periapical granuloma, Periapical cyst, Infected periapical cyst and Condensing osteitis ($p=0.00$, $p=0.00$, $p=0.02$, $p=0.02$, $p=0.00$, $p=0.00$). Sinus tract was significant with widening of periodontal ligament space, and rarefying osteitis ($p = 0.00$, $p = 0.00$). Erythema at root apex was significant with Widening of periodontal ligament space, Rarefying osteitis, Periapical granuloma, Periapical cyst, Infected periapical cyst and Condensing osteitis ($p = 0.00$, $p = 0.00$, $p = 0.03$, $p = 0.03$, $p = 0.00$, $p = 0.00$). Altered tooth color was significant with Widening of periodontal ligament space and Rarefying osteitis ($p = 0.00$, $p = 0.00$). Tenderness on percussion and Vestibular tenderness on palpation was significant with all the variants of periapical pathology ($p = 0.00$ with all the variants). Nonvital tooth was

significant with Widening of periodontal ligament space, Rarefying osteitis and Condensing osteitis ($p = 0.00$ with all the variants). Presence of deep cavity was significant with all the variants of periapical pathology except for Periapical cyst and Infected periapical cyst ($p = 0.00$ with all the variants). (Table 2)

DISCUSSION

The present study showed prevalence of periapical pathology as 86.93%, whereas other authors have reported low prevalence of periapical pathology ranging from 5.5 % 37.99%, 58.4%.^{7,8} The results of the present study shows high prevalence of rarefying osteitis (23.9%) followed by widening of periodontal ligament space (24.9%), condensing osteitis (10.1%), periapical granuloma (11.9%) which were similar to those reported by several other authors.^{1,2,4,6} The present study also showed a higher prevalence of infected periapical cyst (10.7%) and condensing osteitis (10.1%) which is similar to another study.⁹ Other authors have reported a high prevalence of periapical granuloma, followed by rarefying osteitis and periapical cyst.^{10,11}

Lack of awareness regarding the dental treatments and low socioeconomic status in South Asian population leading to patients visit only in an emergency to the dental hospitals could be the possible reason for high prevalence of rarefying osteitis than periapical granuloma, which is relatively less as an emergency.¹² Clinical signs and symptoms associated with periapical lesion were mostly associated with teeth with deep cavity (31%), Tooth associated with tenderness to percussion (23.7%), vestibular tenderness to palpation (10.3%), and intraoral swelling (9.6%). No definitive clinical signs to these variants of periapical pathology could be seen due to quick transitional nature resulting in confusion to the professionals. There are not many studies in the literature presenting with clinical signs of periapical pathology except for a single random population study presented with clinical signs of sinus tract, pain on percussion and/or pain on palpation. This study did not differentiate cases with positive signs of pain on palpation at root apex and pain on percussion.¹² Similar kind of studies showing the clinical signs and symptoms of periapical lesions in single population is not reported in the literature to

the best of our knowledge. Our study also presented the elaborative clinical signs (Table 2) including erythema at root apex and differentiation between the cases with pain on percussion and pain on palpation at root apex.

In the present study, Extraoral and intraoral swellings were significant with rarefying osteitis, and periapical granuloma, whereas intraoral swelling was significant with condensing osteitis. This could be due to the collection of inflammatory contents encroaching from the surrounding tissues. The possible reason for the significance of extraoral swelling with widening of periodontal ligament space, infected periapical cyst and condensing osteitis could be an acute onset or acute exacerbation of the chronic lesion of the periapical disease without radiographic changes, but its significance with condensing osteitis where there is no pressure due to abscess is contradicting.¹² Sinus tract formation is common only in rarefying osteitis,¹³ but its significance with other variants could be attributed to long healing time of the tract. Erythema at the root apex is seen due to the inflammatory exudates raising the soft tissue overlying the periapical region and is seen with all inflammatory lesions.¹³

Altered tooth color is seen due to pulpal necrosis and is significant with all the periapical lesions,¹¹ our study showed this only in association with periapical granuloma, rarefying osteitis and widening of PDL space. Pain on palpation and/ or percussion is also significant in all the variants of periapical pathology, and is in accordance with and supported by the description defining that even at the early stages of periapical inflammation, a firm pressure against the mucosa over the root end may incite a positive painful response.^{12, 14}

Deep cavity is also significant in all the variants of periapical pathology, except for periapical granuloma and infected granuloma as they may repress a stage of radiographic transformation from chronic to acute phase. Widening of periodontal ligament space and infected periapical cyst are highly transitional lesions when compared with periapical granuloma and cysts. The transitional nature of such lesions results in varying and unpredictable prevalence.¹²

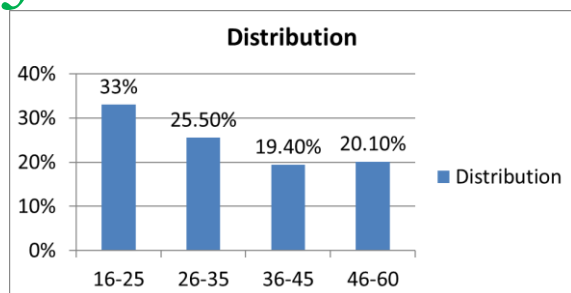
The prevalence of condensing osteitis varied from 4.5 to 21.8% in the literature^{15, 16} whereas the present study showed 10.1%. There were separate studies done either only on condensing osteitis or on rarefying osteitis, periapical granuloma and periapical cyst.^{10, 17} there are no single studies in the literature showed the prevalence of all the variants of periapical pathologies and their clinical presentation in the same population. Being the universal lesions directly associated by anatomy of the jaw bones, local factors and peculiarities of the periapical region conditioned by the specificity of the periodontal complex, distribution of age, sex and anatomical location of the periapical pathologies are not much varied with all the studies including the present study.^{10, 11}

CONCLUSIONS

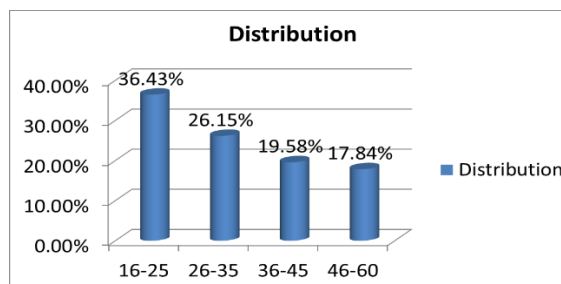
The results of present study show a high significance to various signs of pulp associated pathologies in diagnosing inflammatory periapical lesions, there is a highly significant correlation between the prevalence of periapical pathology and clinical signs. Also, there is a significant correlation of clinical signs with each variant of periapical lesions. Even the experts are often misled by the constantly changing clinical signs and radiographic findings of these inflammatory lesions due to the transitional nature of the pathology. Further studies are suggested using a better and accurate imaging modality like CBCT for better understanding of these periapical pathologies.

Table 1: Distribution of periapical pathologies evaluated by radiographic examination.

periapical pathologies	Percentage
Widening of periodontal ligament space	24.9%
Rarefying osteitis	23.9%
Periapical granuloma	11.9%
Periapical cyst	5.5%
Infected periapical cyst	10.7%
Condensing osteitis	10.1%
No Findings	13%



Graph 1: Distribution of 1522 clinical signs evaluated by clinical examination according to age group.



Graph 2: Distribution of 1323 Periapical pathology evaluated by radiographic examination according to age group.

Table 2: Significance of the clinical signs with each variant of periapical pathology.

Radiographic Findings	Extra oral swelling	Intraoral Swelling	Sinus tract	Erythema at root apex	Altered tooth color	Tenderness to percussion	Tenderness to palpation	Non vital tooth	Deep cavity
Widening of periodontal ligament space	13.3%	28.5%	23.2%	31.6%	17.1%	91.1%	17.6%	13.3%	89.2%
	(p=0.06)	(p=0.00)	p=0.00)	(p=0.00)	(p=0.00)	(p=0.00)	(p=0.00)	(p=0.00)	(p=0.00)
Rarefying osteitis	22.2%	31.3%	21.3%	29.4%	26.2%	77.8%	47.7%	9.3%	73.4%
	(p=0.01)	(p=0.00)	(p=0.00)	(p=0.00)	(p=0.00)	(p=0.00)	(p=0.00)	(p=0.00)	(p=0.00)
Periapical granuloma	19.2%	18.3%	6.2%	19.7%	11.1%	43.5%	21.8%	2.8%	42.9%
	(p=0.00)	(p=0.02)	(p=0.50)	(p=0.03)	(p=0.61)	(p=0.00)	(p=0.00)	(p=0.64)	(p=0.00)
Periapical cyst	3.2%	17.5%	2.2%	11.7%	3.7%	21.8%	17.5%	2.1%	8.7%
	(p=0.24)	(p=0.02)	(p=0.50)	(p=0.03)	(p=0.61)	(p=0.00)	(p=0.00)	(p=0.64)	(p=0.06)
Infected periapical cyst	17.3%	31.2%	4.1%	28.6%	1.3%	43.2%	34.7%	2.1%	3.1%
	(p=0.01)	(p=0.00)	(p=0.06)	(p=0.00)	(p=0.9)	(p=0.00)	(p=0.00)	(p=0.06)	(p=0.06)
Condensing osteitis	9.1%	22.3%	7.1%	18.4%	1.3%	34.3%	11.1%	21.7%	31.5%
	(p=0.06)	(p=0.00)	(p=0.07)	(p=0.00)	(p=0.9)	(p=0.00)	(p=0.00)	(p=0.00)	(p=0.00)

CONFLICTS OF INTEREST

The authors declare they have no potential conflict of interests regarding this article.

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