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COMPARATIVE ANALYSIS OF ACCURACY OF DIAGNOSIS OF CHRONIC PERIAPICAL LESIONS MADE BY CLINICAL AND HISTOPATOLOGICAL EXAMINATION

*KOMPARATIVNA ANALIZA TAČNOSTI DIJAGNOZE HRONIČNIH PERIAPIKALNIH PROCESA
KLINIČKIM I HISTOPATOLOŠKIM PREGLEDOM*

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Summary – Introduction. The preliminary diagnosis of chronic periapical lesions is made on the basis of clinical symptoms and radiographs, which is a reliable diagnostic tool, but it has only a subsidiary role since histopathological verification is essential for the definitive diagnosis. This study was aimed at diagnosing removed chronic periapical lesions and classifying them by size as well as at comparing the clinical diagnoses with histopathological results. **Material and Methods.** The study included 34 patients diagnosed with chronic periapical process by applying clinical examination and radiography. The removed chronic periapical lesions were processed according to classical histological technique and analyzed by hematoxylin and eosin staining protocol. **Results.** According to histopathological analysis 53% of chronic periapical lesions were periapical granulomas and 47% were radicular cysts. The size of the lesions ranged from < 9 mm (70% of lesions), 9 to 20 mm (18% of lesions) and > 20 mm (12% of lesions). The histopathological examination revealed that clinical diagnosis was wrong in 26% of cases. **Conclusion.** A statistically significant difference between clinical and histopathological diagnosis has been found. The histopathological findings strongly suggest the necessity of complete curettage of lesions sizing > 20 mm in order to prevent recurrences.

Key words: Periapical Diseases; Chronic Disease; Diagnosis; Diagnosis, Differential; Periapical Granuloma; Radicular Cyst; Histological Techniques

Introduction

Periapical lesions are the most common pathologic conditions which develop in the root tip of a non-vital tooth, resulting from the necrotic tissue of the root canal that constantly irritates the tissue in the apical region and causes chronic inflammation. Periapical lesions are usually classified according to their histological structures and features determined after surgical removal [1-3]. The classification of periapical processes should be regarded as a dynamic issue, having in mind all features of possible lesions. Thus, an acceptable classification, suggested by Spatafore (1990), encompasses a wide range of lesions such as periapical granuloma, radicular cyst, periapical scar, and other lesions [4].

Most commonly, in about 90% of the cases, clinically and radiologically diagnosed and treated lesions belong to the group of periapical granulomas and cysts. However, a range of other lesions caused by developmental, metabolic, odontogenic or neoplastic disorders, which strongly resemble the inflammatory processes on radiographs, can be de-

tected in the periapical region. Treatment of periapical lesions includes surgical approach and complete curettage of the lesion from the jawbone. Surgical treatment of periapical lesions on the upper and lower molars is a specific and demanding procedure because of the important anatomical structures in the operation field. Therefore, a histopathological examination of removed tissue is essential after surgical removal of periapical lesion.

This procedure presents a reasonable approach due to the fact that the applied therapeutic procedure should ensure the effective healing, and in case of other lesions, subsequent additional treatment after biopsy is necessary. This orientation should be strictly adhered to, regardless of the overall knowledge on the nature of periapical lesions. The basic surgical postulate that "once the tissue is obligatory removed, it must be microscopically examined" should be strictly followed [5,6].

It is of paramount clinical importance to differentiate a periapical granuloma from the initial-stadium cyst, as a successful endodontic therapy of the granuloma is likely to be possible, which is not the case in the

Abbreviations

CRAP – chronic periapical process

initial-stadium cysts. Preoperative differential diagnosis of granulomas and cysts is still a major diagnostic challenge for the dentist. This issue was comprehensively addressed by numerous researchers, and most of them agree that reliable diagnosis is not possible based on radiographic examination alone. A stereotypic and formerly widespread radiological classification, according to which lesions less than 1 cm in diameter are classified as granulomas and larger ones as radicular cysts, is nowadays considered unreliable and inaccurate. Numerous recent research indicated a high level of disagreement between radiological diagnosis and histopathological findings in periapical lesions [5].

Periapical granulomas and radicular cysts cannot be differentiated based on radiographic evidence alone; however, radiolucency size of 1.6 cm and above or 200 mm² suggests, with high probability, the presence of radicular cyst. Generally, the cysts tend to be larger, but an accurate differentiation upon this criterion is not possible as there are large granuloma and small cysts. Radiolucency of radicular cyst in a radiograph is commonly round or of ovoid structure, with narrow and opaque margin of the surrounding bone. Sometimes, in case of rapid cyst growth, the lack of peripheral opacity can be observed. Long-standing cysts can result in root resorption of the affected tooth and even the adjacent one [5,6].

The reliability rate of radiographic examination is 52.7%. Preliminary diagnosis of radicular cyst is established upon clinical symptoms and a radiograph, which is considered a reliable method, though auxiliary one. Final diagnosis definitely requires histopathological confirmation [4].

The aims of research:

1. To establish histopathological diagnosis of removed chronic periapical processes (CPAP);
2. To compare clinical diagnosis with histopathological findings;
3. To classify chronic periapical processes according to size.

Material and Methods

The research was designed as a prospective clinical study carried out at the Department of Oral Surgery of the Clinic for Dentistry of Vojvodina and Centre for Pathology and Histology of the Clinical Centre of Vojvodina in Novi Sad. The research encompassed 34 patients of both sexes, aged between 18 and 70. After clinical examination and radiograph analysis, a chronic periapical process in the intercanine sector of the upper jaw was diagnosed in all patients. The criteria for establishing clinical diagnosis based on RTG scan were as following:

1. Status of lamina dura;
2. Status of periodontal membrane;
3. Preservation of alveolar bone architecture;
4. Status of canal structures;
5. Canal permeability rate;

6. The size of pathological change expressed in millimetres

The measured periapical lesions were distributed into three groups:

1. 5 – 9 mm
2. 9 – 20 mm
3. > 20 mm

After establishing clinical diagnosis, surgical treatment of CPAP was performed including resection (apicotomy) of the affected tooth root top and curettage of the periapical lesion.

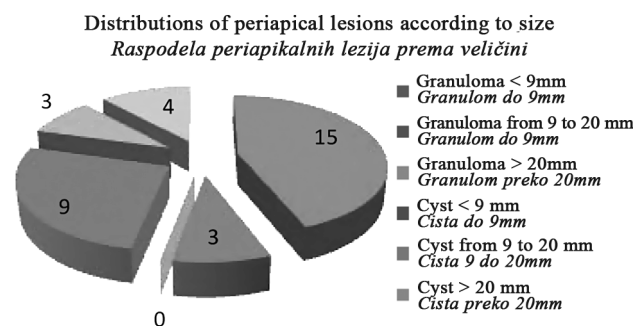
The removed periapical lesions were processed, i.e. 5-µm tissue sections were fixed in 4% formalin, embedded in paraffin and stained by standardized hematoxylin and eosin technique.

Results

Out of total 34 periapical lesions 18 (53%) were histopathologically classified as periapical granulomas, whereas 16 (47%) were radicular cysts (**Graph 1**).

According to the size demonstrated in the radiographic image, periapical lesions were distributed into three groups. Out of the total number of periapical lesions, 24 (70%) sized < 9 mm, 6 (18%) ranged from 9 to 20 mm, whilst 4 (12%) were > 20 mm in size (**Graph 1**).

According to histopathological analysis of periapical lesions ranging from 5-9 mm in size, periapical granulomas and radicular cysts were diagnosed in 15 (62%) and 9 (38%) cases, respectively (**Graph 1**).



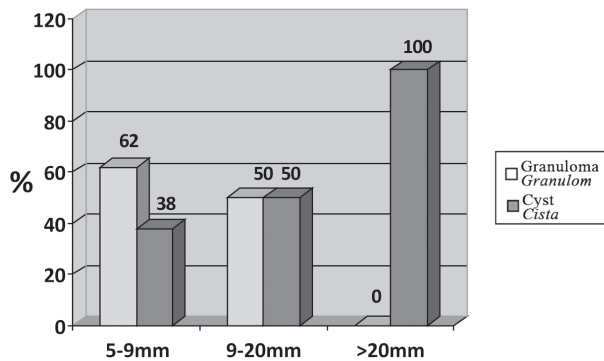
Graph 1. Incidence of periapical lesions according to size
Grafikon 1. Zastupljenost periapikalnih lezija prema veličini

In the group of periapical lesions ranging from 9 mm to 20 mm, three lesions were classified as granulomas and the same number were classified as cysts (**graphs 1 and 2**).

Periapical lesions > 20 mm in size were histopathologically classified as radicular cysts (**Graph 2**).

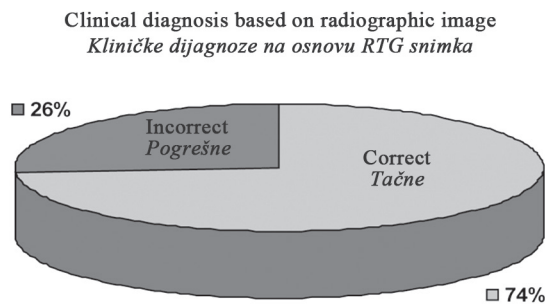
Histopathological analysis of specimens revealed that a wrong clinical diagnosis, which was based on radiographic examination alone, was established in nine patients (26%) out of total 34 cases (**Graph 3**).

Proportional representation of accurate and wrong clinical diagnoses of periapical granuloma is displayed in **Graph 4**.



Graph 2. Proportional representation of granuloma and radicular cysts according to lesion dimension (mm)

Grafikon 2. Procentualna zastupljenost granuloma i cista kod lezija u zavisnosti od veličine lezije

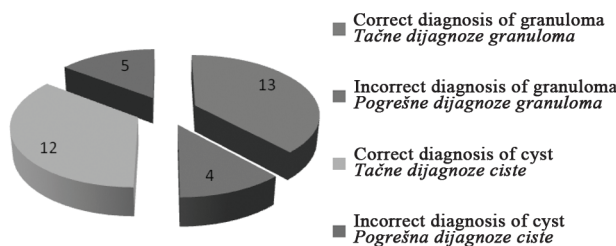


Graph 3. Proportional representation of the accuracy of clinical diagnosis compared to the histopathological examination

Grafikon 3. Procentualni prikaz tačnosti kliničke dijagnoze u odnosu na histopatološki nalaz

Proportional representation of accurate and wrong preliminary clinical diagnoses of radicular cysts is presented in **Graph 4**.

Distribution of periapical lesions according to accuracy of diagnosis
Raspodela periapikalnih lezija prema tačnosti dijagnoze



Graph 4. Incidence of periapical lesions according to diagnosis accuracy

Grafikon 4. Zastupljenost periapikalnih lezija u odnosu na tačnost dijagnoze

Statistical analysis of the obtained data, using the χ^2 test, revealed a statistically significant difference between accurate and wrong clinical diagnoses (**Table 1**).

Discussion

Upon microscopic examination of histological specimens of extirpated material only chronic periapical

Table 1. Statistical significance of correct and incorrect clinical diagnosis

Tabela 1. Prikaz značajnosti razlike klinički tačnih i netačnih dijagnoza

	Po	Oč	Po - Oč	(Po - Oč)	(Po - Oč)
Correct clinical diagnosis					
Incorrect clinical diagnosis					
Granuloma	13	4	9	81	20,25
Granulom					
Cyst/Cista	12	5	7	49	9,8
Total/Ukupno	25	9			30,5

$\chi^2 = 30.5; \chi^2 t = 3.841; \chi^2 > \chi^2 t; p < 0.05$

lesions were diagnosed, i.e. periapical granulomas and radicular cysts. Chronically inflamed connective tissue lacking lumen and epithelial envelope indicated periapical granulomas. Chronically inflamed connective tissue containing epithelium-lined cyst cavity suggested the existence of radicular cyst. Stratified squamous epithelium without keratinisation was the most prevalent, whereas in some cases the presence of keratinized stratified squamous epithelium or parakeratosis was observed.

The results of our research revealed the incidence of radicular cysts and periapical granulomas of 47% and 53%, respectively. It is noteworthy that 100% of chronic periapical lesions examined in our study belonged to the group of periapical granulomas and cysts. Histopathological findings of several other research studies revealed somewhat different incidence of chronic periapical lesions. In a study that included 227 chronic periapical lesions, histopathological analysis confirmed the incidence of radicular cysts and periapical granulomas to be 84.1% and 15.9%, respectively [7]. Another clinical study, which encompassed 164 patients with chronic periapical process, established the presence of radicular cysts in 54.88% cases and periapical granulomas in 45.12% cases [8]. The results were obtained using histopathological examination. In the radiograph, radicular cysts appear as more or less clearly margined round or oval radiolucency surrounded by an area of peripheral bone sclerosis in the region of root tip, which commonly protrudes into the cyst lumen. In more severe inflammation, frequent acute exacerbations or poor immune response of the host, the complete or partial lack of marginal condensation zone can be observed. Root resorption of the affected tooth may occur as well. Lamina dura and periodontal membrane are interrupted in the region of tooth root tip that protrudes into the cyst. Radiograph of smaller cysts is identical to the one of periapical granulomas, thus this diagnostic criterion is not applicable for cyst verification. Radiography is not considered a fully reliable diagnostic method for the assessment of radicular cysts incidence [5].

Of the 34 periapical lesions, wrong clinical diagnosis was established in 26% cases that were subsequently confirmed by histopathological analysis. An accuracy rate of preliminary diagnosis of 52.7% is reported in the literature, whereas the percentage of accurate preliminary clinical diagnosis in our study was 74%. A study carried out in our region, encompassing 145 cases, revealed a 30% rate of disagreement between radiological and histopathological diagnosis. Out of 17 established

radiography-based clinical diagnoses of periapical granuloma, 76% were accurate and 24% were wrong diagnoses, which was confirmed by histopathological finding. Furthermore, out of 17 clinical diagnoses of radicular cyst, 71% were accurate, whereas 29% were wrong diagnoses [9]. Brazilian authors, who compared clinical and histopathological diagnosis, reported levels of correlation between clinical and histopathological diagnosis of periapical granuloma and radicular cyst to be 61.97% and 76.27%, respectively [8].

Mortenson (1970) classified chronic periapical lesions into the following groups [1]:

1. Lesions 5-9 mm in size. 1/3 cysts, 2/3 parodontitis;
2. Lesions 9-20 mm in size. 1/3 parodontitis, 2/3 cysts;
3. Lesions larger than 20 mm, mostly cysts.

Based on our research and size of the periapical lesions, similar results were obtained:

1. Lesions up to 9 mm. ~ 1/3 cysts (37.5%), ~ 2/3 parodontitis (62.5%);

2. Lesions 9-20 mm in size. 1/2 cysts (50%), 1/2 parodontitis (50%);

3. Lesions larger than 20 mm. Cysts (100%).

Conclusion

According to the results obtained in our research, the following conclusions can be made:

1. Out of 34 lesions, histopathological analysis revealed the presence of granulomas and radicular cysts in 18 (53%) and 16 (47%) cases, respectively;

2. The disagreement between clinical diagnosis and histopathological findings was observed in 26% cases, which is considered to be a statistically significant difference in regard to the accuracy of established diagnosis;

3. The importance of accurate diagnosis of chronic periapical lesions, particularly of radicular cysts, strongly affects the extent of surgical procedure taking into consideration a high rate of recurrences that may result from such lesions.

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Sažetak

Uvod

Preliminarna dijagnoza hroničnih periapikalnih procesa postavlja se na osnovu kliničkih simptoma i radiograma koji je pouzdano sredstvo u dijagnostici, ali ima samo pomoćnu ulogu jer je za konačnu dijagnozu neophodna histopatološka verifikacija.

Cilj rada bio je utvrđivanje histopatološke dijagnoze odstranjenih hroničnih periapikalnih procesa, njihova klasifikacija i upoređivanje postavljene kliničke dijagnoze sa histopatološkim rezultatima.

Materijal i metode

Ispitivanjem su obuhvaćena 34 pacijenta kod kojih je na osnovu kliničkog pregleda i analize rendgenskog snimka postavljena dijagnoza hroničnog periapikalnog procesa. Odstranjeni periapikalni procesi su obrađeni klasičnom histološkom tehnikom i bojeni metodom hematoksilin-eozin.

Ključne reči: Periapikalne bolesti; Hronične bolesti; Dijagnoza; Diferencijalna dijagnoza; Periapikalni granulom; Radikularna cista; Histopatološka analiza

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Rezultati

Od svih periapikalnih procesa, na osnovu histopatološke analize, ustanovljeno je da 53% pripada periapikalnim granulomima, a 47% radikularnim cistama. Od ukupnog broja periapikalnih procesa 70% je bilo veličine < 9 mm, 18% veličine od 9 do 20 mm, a 12% je bilo > 20 mm. Nakon sprovedene histopatološke analize ustanovljeno je da je kod 26% slučajeva postavljena pogrešna klinička dijagnoza.

Zaključak

Postoji statistički značajna razlika između tačnih i pogrešnih kliničkih dijagnoza. Histopatološki nalaz ukazuje da lezije > 20 mm treba u potpunosti iskirirati tokom operacije da ne bi došlo do recidiva.