Clinical, imagistic and histopathological study of chronic apical periodontitis

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Abstract
Periapical lesions are among the most frequent periodontal pathologies in human teeth, generally called apical periodontitis. Apical periodontitis is a continuation of the endodontic space infection and it is manifested as a response of the host defense against the microbial action. It may determine local inflammation, hard tissue resorption, destruction of other periapical tissues. The preliminary diagnosis of chronic periapical lesions is based on the clinical symptoms and imagistic investigation, which represent a reliable diagnosis instrument, but the histological investigation remains essential for a certain diagnosis. We performed a clinical and histological study of the periapical lesions, evaluating the various clinical and imagistic aspects and we compared them with the results of the histological examination, in order to establish the correspondence between the clinical-imagistic aspects and the morphological ones. The relation between the histological aspects, the clinical signs and imagistic aspects may provide valuable data both for establishing an accurate diagnosis and for adopting the most efficient treatment.

Keywords: chronic apical periodontitis, granuloma, radicular cyst, periapical lesions.

Introduction
Chronic apical periodontitis, an inflammatory reaction of the apical periodontium, is a condition with a high incidence and whose treatment does not always lead to an improvement, which can represent an etiological factor of edentation. It is a destructive-proliferative inflammation, leading to the lysis and metaplasia of the periodontal components. It may have various clinical aspects, determined by a diverse etiology, by an individual reactivity and by the diverse structure of the apical periodontium. In the studied cases, we found various clinical aspects, some of them presenting obvious manifestations, others having an asymptomatic progress. The pulpar and periapical pathologies are closely linked in most cases, as pulpar damage precedes the periodontal damage. That is why the specialty literature uses the term pulpo-periapical pathology. Periradicular lesions mainly involve the apical periodontium, with no predominance related to race, gender or age [1, 2]. Periapical lesions are usually classified according to their histological structure [3–8]. Thus, Spatafore et al. classifies them into: periapical granuloma, radicular cyst, periapical cicatrices and other lesions [9].

The treatment should be individualized and it must be applied after an accurate diagnosis, resulting from the corroborration between the clinical and imagistic aspects. The histological study of this pathology provides various aspects, due to multiple forms, being the only one that may validate or invalidate the accuracy of the clinical diagnosis. This leads to the necessity of knowing the histological aspects, their imagistic correspondents and the clinical manifestations of every clinical form of this pathology.

The histopathological study is important because, in the same clinical and imagistic manifestations, the histological aspect may have various forms (chronic fibrous apical periodontitis, hyperplastic or granulomatous forms, diffuse chronic apical periodontitis and forms of condensed chronic apical periodontitis). Also, it is important to detect the factors orienting the evolution towards one of the histopathological forms, so that it may contribute to the prevention and treatment of these lesions.

The purpose of our study is to compare the results obtained through clinical, radiological and histopathological investigations, in order to clarify some of the difficulties of diagnostication and to identify the predictable post-treatment complications.

Patients, Materials and Methods
The clinical study included a group of 132 patients diagnosed with chronic apical periodontitis, selected after the examination of 258 patients that presented for specialty treatment, between November 2012–March 2016, in the Clinic of Dental Prosthetics within the University of Medicine and Pharmacy of Craiova, and also in a Private Clinic in Craiova, Romania. In order to establish the degree of apical periodontium damage, and also for verifying the conservatory treatment, there was performed an imagistic investigation with retroalveolar dental X-rays, ortho-
tomography (CT) examination in order to obtain some serial images of the apical lesions, at the beginning of treatment, during the treatment and at the end of the treatment, as well as the monitoring of lesions at various periods of time after the treatment was ended.

The patients were clinically evaluated and distributed in groups, according to various parameters: age, gender, living environment, damaged teeth, their localization, number of lesions in a patient, objective and subjective aspects, type of imagistic investigation performed, the imagistic aspect of the apical lesion and presence of other associated conditions.

The statistical analysis of the data obtained after the clinical study was performed with Microsoft Excel 2010 (Microsoft Corp., Redmond, WA, USA), together with XLSTAT 2014 for MS Excel (Addinsoft SARL, Paris, France) and IBM SPSS Statistics 20.0 (IBM Corporation, Armonk, NY, USA).

The histological study was performed on 65 fragments obtained after the performance of the surgical treatment of endodontic periapical lesions (apical resection) and post-extraction. The fragments were fixed in 10% formalin. In 12 pieces there was performed an electrolytic decalcification with 5% hydrochloric acid or with 10% trichloroacetic acid. Then, the fragments were processed through the histological method of paraffin inclusion, with Hematoxylin–Eosin (HE), Masson’s and Goldner–Szekely (GS) trichrome stainings.

Results

Of the 132 patients in the study group, 45 presented a history of acute stage, the patients presenting various acute episodes, while 87 patients presented no previous acute episodes. Fifty-seven (43.1%) patients were women and 75 (56.8%) patients were men. There was a higher incidence in men, probably due to a higher reluctance regarding the dental treatment, which caused a longer evolution of untreated caries processes, as well as to various particularities of general reactivity. Still, taking into consideration the fact that the population in Dolj County (Romania) consists of 48.8% men and 51.2% women, we can state that there is no significant difference between these ratios and the ones calculated for the total number of studied subjects, the p-value calculated by the Z-test for ratios being p=0.063. In conclusion, gender does not represent a major factor influencing the studied pathology.

Of the 132 patients diagnosed with chronic apical periodontitis, nine (6.82%) were aged less than 20 years old, 16 (12.12%) between 20–30 years old, 43 (32.58%) between 30–40 years old, 36 (27.27%) between 40–50 years old and 28 (21.21%) over 50 years old (Figure 1).

Although there is an imbalance regarding the percentage distribution according to gender in the age group over 50 years old, in comparison to the gender distribution of the studied group, on the whole we cannot consider any differences as far as the gender and age distribution is concerned, the result of square chi-square test being statistically not significant (p=0.291>0.05).

An interesting fact is that there is a highly significant difference regarding the age and environment distribution (chi-square test, p=0.0009<0.001), the younger patients coming mostly from the urban area (73.53%), while older patients, over 40 years old came mostly from the rural area (54.69%).

**Figure 1 – Distribution of chronic apical periodontitis on age groups.**

Chronic periapical lesions were identified in 68 (51.5%) cases in the pluriradicular teeth and in 64 (48.4%) cases in the monoradicular teeth. According to the affected teeth, we observed that in 49 (70%) cases there were identified in the maxillary lateral teeth and in 43 (69.35%) cases in the mandibular lateral teeth. In the maxillary, there were identified 21 (30%) frontal teeth and 19 (30.65%) mandibular frontal teeth with periapical periodontitis (Figure 2).

**Figure 2 – Distribution according to the damaged region.**

The study of the connection between the reason for presentation and the localization of the damaged teeth showed a highly significant difference between the frontal teeth and the lateral ones (chi-square test, p<0.001), the presentation in the case of frontal teeth being determined by the change in aspect, while pain was the main complaint for the lateral teeth (Table 1, Figure 3).

The 132 patients under study presented in the teeth with a periapical pathology various associated local lesions that probably caused chronic apical periodontitis, namely: 55 patients presented improperly performed endodontic treatments, 32 patients presented complicated profound carries with pulpar damage, 21 patients presented fractured elements on the radicular canal, and 24 patients presented coronary composite obturations with no pulpar protection.

As far as the clinical manifestations of the studied group were concerned, we observed that 49 (37.12%) patients presented no symptoms of the damaged tooth, 19 (14.39%) patients had subjective manifestations such as mastication pain, egression sensation of the causal tooth,
26 (19.7%) patients presented objective manifestations of fistula, a positive examination of the tooth axis percussion, gingival mucosa congestion, while 38 (28.79%) patients presented both subjective and objective manifestations (Figure 4).

Table 1 – Distribution of cases depending on the localization of the damaged teeth and on the reason of patient presentation

<table>
<thead>
<tr>
<th>Reason for presentation</th>
<th>Aspect</th>
<th>Pain</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontal teeth</td>
<td>30 (75%)</td>
<td>10 (25%)</td>
<td>40 (100%)</td>
</tr>
<tr>
<td>Lateral teeth</td>
<td>12 (13.04%)</td>
<td>80 (86.96%)</td>
<td>92 (100%)</td>
</tr>
<tr>
<td>Total</td>
<td>42 (31.82%)</td>
<td>90 (68.18%)</td>
<td>132 (100%)</td>
</tr>
</tbody>
</table>

Regarding the imagistic method of investigation for chronic apical periodontitis cases, 80 patients were identified based on retroalveolar X-rays (RIO – retroalveolar isometric orthoradial), 41 patients based on panoramic X-rays (OPG – orthopantomogram) and 11 patients based on cone-beam computed tomography (CBCT) (Figure 5).

Table 2 – Different degrees of correlation between the clinical and imagistic examinations

<table>
<thead>
<tr>
<th>Correspondence between the clinical and imagistic examinations</th>
<th>No. of cases</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimal clinical symptoms and present Rx</td>
<td>74</td>
<td>59.68%</td>
</tr>
<tr>
<td>Major clinical symptoms and minor Rx</td>
<td>23</td>
<td>18.55%</td>
</tr>
<tr>
<td>Present clinical symptoms and absent Rx</td>
<td>35</td>
<td>28.23%</td>
</tr>
<tr>
<td>Total</td>
<td>132</td>
<td>100%</td>
</tr>
</tbody>
</table>

According to the X-ray image, we observed that 39 (31.45%) patients presented conjunctive simple granuloma with a radio-transparent image surrounding the radicular apex, having a round contour with variable dimensions that demarcate it from the neighboring bone, 27 (21.77%) patients had fibrous chronic apical periodontitis, imagistically presenting a higher transparency around the radicular apex, with the enlargement of the peri-apical space and an aspect of heterogeneous osteoporosis, 37 (29.84%) patients presented cystic granuloma, with an X-ray image rendering an inside liquid, identified by a more intense radiotransparency inside the imagistic picture. There were identified 18 (14.52%) patients with chronic apical periodontitis and hypercementosis, identified by the presence of certain deformities of the apical contour with excessive deposits of cement alongside the whole dental root or in the apical area. Partsch progressive diffuse chronic apical periodontitis was identified in six (4.84%) patients, by the presence of periapical osteolysis with diffuse contour and a darker center area. The image also extended towards the neighboring teeth, thus creating diagnosis confusions in localizing the damaged tooth. Also, there were identified five (4.03%) cases of condensed chronic apical periodontitis, caused by the periapical area demineralization, during the imagistic examination the
lesion having a white aspect, with a higher intensity than the surrounding bone (Figure 7).

During the microscopic examination of the histological samples of chronic apical periodontitis, there were diagnosed hyperplasic forms (granulomas), cystic forms (radicular cyst), and dystrophic forms (fibrous chronic apical periodontitis). The periapical granuloma and the radicular cyst are considered the most important lesions found in teeth with necrotic pulp or with an improper canal treatment. The most frequent form found on the examined sections was represented by the periapical granuloma.

From the histopathological point of view, the lesions found in various forms of chronic apical periodontitis presented a damaging character of the periodontal tissues and the radicular apex, with a variable extension. The damaged structures were replaced by a tissue that, due to its morphological particularities, was included in a particular form of chronic apical periodontitis. In all these forms, there was present an inflammatory conjunctive tissue, associated or not with an epithelial tissue and associated or not with an epithelial tissue and forms, there was present an inflammatory conjunctive tissue and their manner of displacement was different, indicating various aspects that may be correlated with the progressive particularities of these structures. On the sections, together with the cells there were identified various capillary blood vessels (Figure 8B).

The sections taken from the cases with a long evolution presented a predominance of the lympho-plasmocitary infiltrate, a relative reduction of the vascular component, an intra-granulomatous fibrillogenesis and an encapsulation fibrosis (Figure 8C). In these situations, the collagen fibers at the end of the granulomatous formation make up a surrounding membrane, with a role in limiting the inflammatory process (Figure 8D). Among the collagen fiber fascicles, there sometimes remains a residual inflammatory process (Figure 8E). In some cases, at the end of the granuloma there was present an important vascular component and an inflammatory cellular infiltrate, mainly of the macrophage type, indicating a tendency of invagination (Figure 8F).

On certain sections, the conjunctive granuloma presented an epithelium located either at the end of the granuloma, or inside it, under the form of capsules. When it was identified at the end of the granuloma, it had a lining aspect (Figure 9A). Sometimes, the epithelium was identified inside the granuloma, under the form of an arcuate line. The epithelial arcades entered the granuloma and divided it into compartments (Figure 9B). Other times, the epithelium was identified as small islands or trabecules of various thicknesses, inside the conjunctive tissue (Figure 9C).

If the vascularization present in a mixed, conjunctive–epithelial granuloma is not sufficient for providing the nutrition of epithelial cells, they may degenerate, determining the formation of certain cystic cavities, thus resulting the cystic granuloma. In these situations, mixed, conjunctive–epithelial granulomas have a potential of cystic transformation (Figure 9D). The radicular cyst is characterized by the presence of a cavity, partially or totally lined by a paving stratified epithelium, presenting thick or discontinued areas (Figure 9, E and F). The fibrous wall of the cyst is inflamed, presenting a chronic cellular infiltrate of different stages, mainly consisting of macrophages, lymphocytes and plasmocytes, together with small blood vessels. The cystic cavity contains a serous liquid and cytoplasm cellular elements with a spongy aspect, due to the lipid dystrophy suffered by the epithelial cells. The resulted cholesterol through cellular degenerescence is stored as crystals in the cyst wall. In the histological technique of paraffin inclusion, the cholesterol deposits, being solved by the used organic solvents, appear as clear areas. The cyst paining stratified (with no keratinization) epithelium presents aspects of spongiosis and inflammatory infiltrate. The cystic granuloma, through its progressive evolution, may determine important bone alterations.

On certain pieces, there were present lesions of fibrous chronic apical periodontitis, identified by the presence of a fibroparous conjunctive tissue containing fibroblasts–fibrocyte cells, areas of lympho-plasmocitary inflammatory infiltrate and blood vessels, associated with fibrosis areas (Figure 10, A and B). Fibrosis associated with a reduction of vascularization shows a tendency to limit the lesion, and associated with dystrophy processes, it indicates a long-term lesional process.
Figure 8 – Conjunctive granuloma: (A) Mixed cellularity with conjunctive cells like fibroblasts, histiocytes, lymphocytes, plasmocytes and macrophages (HE staining, ×100); (B) Inflammatory process with various blood vessels (HE staining, ×100); (C) Conjunctive granuloma with intra-granulomatous fibrillogenesis (HE staining, ×100); (D) Collagen fibers with a role of the granuloma demarcating membrane (Masson’s trichrome staining, ×100); (E) Residual lymph plasmocyte infiltrate among the collagen fibers (Masson’s trichrome staining, ×100); (F) Tendency of ingravescence, by vascularization of the granuloma periphery (HE staining, ×100).
Figure 9 – (A) Mixed, conjunctive-epithelial granuloma. The epithelium is placed at the periphery (Masson’s trichrome staining, ×100); (B) Mixed, conjunctive-epithelial granuloma, with cellular cords that divide it into compartments (GS trichrome staining, ×100); (C) Mixed, conjunctive-epithelial granuloma. Epithelial island inside the conjunctive tissue (Masson trichrome staining, ×200); (D) Mixed granuloma with a potential of cyst transformation, by the degenerescence of epithelial cells (Masson’s trichrome staining, ×200); (E) Cystic granuloma (Masson’s trichrome staining, ×100); (F) Cystic granuloma (Masson’s trichrome staining, ×200).
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Discussion

In the etiopathogenesis of apical periodontitis, there are incriminated general factors (chronic intoxications, hypovitaminosis, infectious diseases, systemic diseases, endocrine disorders, vascular conditions, etc., which affect the general resistance of the organism and implicitly alter the quality of the periodontal conjunctive structures, thus favoring the disease onset) and local factors (traumas, heat aggressions, action of chemical substances and bacterial factors). Periapical lesions represent the most frequent pathology affecting the radicular apex of a non-vital tooth. It is the result of the necrotic detrituses in the radicular canal that constantly irritate the tissue of the apical region and lead to chronic inflammation. Because there is a very close connection between the pulpar pathology and the periapical one, in most cases, pulp damage is precursory of chronic apical periodontitis, and because of this, the term of apical pulpar pathology is no longer used. Even though the condition has a high incidence, the treatment is a difficult one and the condition may frequently cause edentation, chronic apical periodontitis representing a poorly studied chapter of odontal pathology. There is required a differential diagnosis before starting any treatment, that is why a histopathological examination is necessary in order to avoid an over-aggressive treatment instead of a more conservative one.

Clinical aspects varied from clear clinical signs up to cases with no symptoms, diagnosed after complementary investigations. The large picture of clinical signs is the consequence of a diverse etiology, of the apical periodontium structure and especially of each individual’s reaction. Cases with a long-term evolution were also accompanied by general symptoms (fatigue, subfebrility, joint pain, etc.) that draw attention upon the probability of a distant microbial dissemination, characteristic of a focus. The imagistic oriented the diagnosis, especially in the cases with no symptoms, but there were also opposite cases, where the clear clinical symptoms were not accompanied by an imagistic confirmation. This is because the bone transparency alteration occurs after a certain period of time, or the bone alteration must reach a certain stage in order to become imagistically clear.

The most frequent periradicular lesions with an endodontic origin are granulomas, cysts, fibrous chronic apical periodontitis and periapical abscess. This periapical pathology presents a different treatment and prognosis, being considered clinically suggestive for an apical periodontitis, but it should be confirmed by a histopathological examination [10–12].

Most frequently, in almost 90% of the cases, clinically and imagistically diagnosed, the lesions pertain to the group of periradicular granulomas and cysts, still a series of other lesions caused by growth, metabolic disorders, odontogene or neoplastic that resemble the inflammatory processes on X-rays, and may be detected in the periapical region [13, 14]. Teeth with periradicular lesions, mostly diagnosed as a cyst, granuloma, fibrous chronic apical periodontitis or abscess on the imagistic film, may not be accurately diagnosed. Therefore, it is necessary that the scraped material should be sent for the histopathological examination. The periradicular lesion treatment includes a surgical approach and a full scraping. In this way, the material for the histopathological examination may be obtained. This statement, according to which “once the tissue is removed, it must be microscopically examined”, should be respected [15].

The histopathological study is important due to the fact that, even with similar clinical and imagistic signs, the histopathological picture may have different forms (fibrous chronic apical periodontitis, hyperplasic or granulomatous forms, diffuse chronic apical periodontitis and condensed chronic apical periodontitis). Also, it is important to detect the factors orienting the progress towards one of the histopathological forms, so that it may contribute to the prevention and treatment of these lesions. When inflammation reached a chronic stage, the host responds with a vascular cellular proliferation, in an attempt of repairing the lesion, thus leading to the formation of a new tissue, known as granulation tissue [16].
Recent research indicated that there is a high level of discrepancy between the imagistic diagnosis and the histopathological one [4]. Specialty literature considers that the reliability rate of the imagistic investigation is 52.7%, the certainty diagnosis requiring a confirmation by the histopathological examination.

Although the presence of a lining cystic cavity is considered the diagnosis for a periapical cyst, the presence of the proliferated epithelium with no cystic cavity is also considered as having the potential of turning into a periapical cyst. A subgroup of epithelium periapical granulomas is considered to present early or potential cystic changes. In the studied cases, granulomas with an epithelial component were included in the group of mixed, conjunctive–epithelial granulomas. Of these, some have the potential of transforming into a cyst.

The periapical granuloma and the radicular cyst may be considered as the most lesions that may appear in the teeth with a necrotic pulp or with inappropriate root canal treatment [17]. In our cases, as well, the highest frequency was presented by these histological forms.

A long-term evolution may lead to the reduction of the inflammatory process, with less chronic inflammatory cells, like lymphocytes, plasmocytes, macrophages, and blood vessels, but with various fibroblasts present in a fibrous stroma conjunctive tissue. This structural aspect observed by us complies with observations from other authors [18, 19]. There are authors that classify periapical granulomas in immune and non-immune granulomas [20, 21]. In the immune granuloma, the chronic inflammatory infiltrate is mainly represented by lymphocytes and plasmocytes, while non-immune granulomas mainly contain macrophages and giant cells, plasmocytes being quite rare. However, this classification, performed many years ago, does not take into consideration the fact that macrophages also belong to the immune system cells. Their presence is necessary both at the beginning of the defense process and at its end, macrophages acting either as antigen-presenting cells, or as “trash collector cells”, which remove cellular exudates and detritus. On the sections, we also found a chronic inflammatory infiltrate made up of lymphocytes, plasmocytes and macrophages, with a main prevalence of lymphocytes and plasmocytes.

In chronic apical periodontitis, we currently find epithelial areas, made up of Malassez epithelial cells, with a slowly proliferating characteristic. Thus, Leonardi et al. examined 17 periapical granulomas and found epithelium associated with inflammatory cells in 10 cases [22]. Epithelial cells are commonly arranged in small islands, or in sequences or trabecules of different thickness, like we found in the investigated patients. In our study, the conjunctive granulomas associating an epithelium, without any cavity, were considered as mixed, conjunctive–epithelial granulomas.

A radicular cyst is a chronic inflammatory lesion with a closed pathological cavity, partially or completely lined up by a pavement-stratified epithelium [23, 24]. The fibrous wall is inflamed, presenting a chronic cellular infiltrate of various stages, mainly consisting of macrophages, lymphocytes and plasmocytes, together with small blood vessels [25]. In the radicular cysts, the cholesterol crystals move towards the epithelium lined cyst [26]. Occasionally, in periapical cysts, the literature shows the presence of a partially or totally lined epithelium of the column cilia cylinder type or with other mucus secretory cells. These aspects may be due to the migration of these cells either from the maxillary sinus or nose cavity, squamous epithelium metaplasia or pluripotent cell differentiation inside the maxillary [27]. Other authors found three cysts lined with cilia column epithelium from 256 analyzed periapical lesions [28]. The lesions that presented a conjunctive tissue with variable diffuse inflammatory infiltrate and the formation of a continuous or discontinuous stratified squamous epithelium were considered inflammatory cysts by some authors.

The cyst etiopathogenic is particularly controversial [29], their formation being explained by various theories, such as epithelial colonization, epithelial cavitation or microabsesses formation. The first theory is based on the formation of a fistula epithelial trajectory up to the granuloma, from a fistula periapical abscess in the oral cavity. When communication is closed, epithelial cells already completely colonized the abscess and gave birth to a radicular cyst. According to the epithelial cavity theory, there are created epithelial cell accumulations. The farthest ones from the nourishing conjunctive tissue, without any vascularization they undergo degeneration and necrosis, thus forming the central area of the cyst. Ricucci & Bergenholtz consider that there is too little known about the etiopathogenic mechanisms of cyst formation [30].

Another form of chronic periapical lesion is the cicatrix tissue, a reparatory response of the fibrous conjunctive tissue, characterized by the formation of dense collagen instead of the mature bone. The prevalence of these lesions varies between 6.6% up to 12%. This periapical cicatrix tissue originates from conjunctive tissue forming cells that colonize the periradical region before the cells responsible for generating various periodontal components perform this action [31]. Fibrous chronic apical periodontitis is a form of chronic apical periodontitis that has the etiology of irritative, traumatic and chemical factors, due to the endodontic treatments. We also found this form in the investigated cases, being formed of various collagen conjunctive fibers and a reduced number of inflammatory cells and blood vessels, which indicates the existence of a residual inflammatory process.

The data we obtained by the study performed were used to correlate the clinical, radiological and histological aspects in order to verify the emergence of certain interference factors in the progress of the lesonal inflammatory process.

In the specialty literature, the apical granuloma incidence varies according to different authors, between 9.3% and 87.1% and that of apical cysts between 6% and 55% of all chronic inflammatory apical lesions [32–35]. This difference is possible due to various criteria used in the histological studies, because the limit between one diagnosis and another is not clearly defined in the literature. Thus, some authors established the diagnosis of cyst when there is a cavity partially or completely lined up by an epithelium [36]; when the lesion emerged
from a granulation tissue with epithelial proliferation, but with no cavity, the diagnosis was granuloma. The histological diagnosis of the sections presenting an epithelial tissue may lead to an incorrect classification of these lesions, by considering they cysts. Ramachandran Nair et al. performed a study on serial sections, where only 15% of the epithelial lesions were actually periapical cysts [37].

Our results are in accordance with the findings presented in the specialty literature that reported a higher prevalence of periapical granulomas in comparison to cysts. According to the histological examination of the periapical lesions, we diagnosed conjunctive granulomas in 30 cases (22 conjunctive granulomas and eight cases presented an epithelial component), representing 46.15%, 25 (38.46%) cases of radicular cyst, and 10 (15.38%) cases of fibrous chronic apical periodontitis.

Conclusions
The importance of the histological examination comes from the observations that the histopathological picture can present various forms for the same clinical and imagistic symptoms. Thus, the study of the histological aspects of various forms of chronic apical periodontitis, with highlighting the relation between these aspects and the clinical signs and imagistic aspects, may provide valuable data both for establishing an accurate diagnosis and for adopting the most efficient treatment.

Conflict of interests
The authors declare that they have no conflict of interests.

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