



Original study

**PREVALENCE REGARDING THE TYPE OF  
PERIAPICAL PATHOLOGY IN 102 HUMAN  
TEETH EXTRACTED WITH ASSOCIATED  
PERIAPICAL LESION**

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**ABSTRACT**

**Objective:** The aim of the present study was to verify the prevalence of the cystic and non-cystic lesions, with varied degrees of abscess severity, in teeth bearing periapical lesions associated to the dental apex at the time of their extraction.

**Material and methods:** In order to do so, semi-serial cuts were conducted in 102 periapical lesions which were then dyed by the HE technique. The lesions were

classified by two observers in periapical granuloma, 1,2 and 3 degrees periapical abscess, 1,2 and 3 degrees periapical cyst and abscessed cyst. After undertaking this first analysis, the lesions were then grouped in non-cystic of minor severity of abscess (periapical granuloma and 1 degree abscess) and major severity (2 and 3 degrees abscesses) and in cystic lesions of minor severity (1 degree periapical cyst e abscessed cyst) and major severity of abscess (degrees 2 and 3 abscessed cysts).

**Results:** The cysts totaled 24,5% of the sample and 84% of them presented high degrees of severity. The most prevalent histological diagnosis (63,7%) was the one of degrees 2 and 3 periapical abscess, i.e., non-cystic lesions with high degrees of abscess. **Conclusions:** It was thus concluded that the cystic lesions add to nearly 24,5% of the periapical pathologies associated to radicular canal necrosis and that the majority of the chronic periapical lesions (84,3%), independently of being cystic (20,6%) or non-cystic (63,7%), show severe degrees of abscess.

**Key words:** Periapical pathology, diagnosis, cysts, granuloma, abscess

## INTRODUCTION AND REVIEW OF LITERATURE

A number of studies have demonstrated the unfeasibility of the radiographic diagnosis for differentiating the periapical lesions<sup>1-7</sup>. Perhaps the fact that the radiographic image only suggests the diagnosis of periapical lesions would explain the existence of the countless scientific papers<sup>1-23</sup> which have utilized the histological exam of these lesions in order to establish the differential diagnosis.

After evaluating the results of the prevalence of granuloma and periapical cysts in these studies, one is able to perceive that the degree of disagreement among these authors is very high, since the percentage of discovered cystic lesions varies from 3,2%<sup>18</sup> to 54%<sup>1</sup>, whereas the percentage of granuloma varies from 45%<sup>13</sup> to 96,8%<sup>18</sup> (Table 1).

Table 1 – Incidence of cysts and periapical granuloma in various studies.

Year	Author	n° of cases	Cysts (%)	Gran. (%)	Others (%)
1954	PRIEBE, LAZANSKY e WUEHRMANN <sup>1</sup>	101	54	46	-
1956	BAUMANN & ROSSMAN <sup>2</sup>	121	26	74	-
1958	WAIS <sup>9</sup> *	50 (am. 1)	26	64	10
		50 (am. 2)	14	84	2
1963	GROSSMAN & ETHER <sup>10,11</sup>	484	11,6%	79,1%	9,3%
1964	LINENBERG, WALDRON & DELAUNE <sup>3**</sup>	110	28 (9)	62 (81)	10
1964	PATTERSON, SHAFER & HEALEY <sup>12</sup>	501	14	84	2
1966	BHASKAR <sup>4</sup>	2308	42	48	10
1968	LALONDE & LEUBKE <sup>13</sup>	800	44	45	11
1970	LALONDE <sup>5</sup>	1097	44	56	-
1970	MORTENSEN, WINTHER & BIRN <sup>5</sup>	396	41	59	-
1973	MORSE, PATNIK & SCHACTERLE <sup>14</sup>	40	23	77	-
1976	BLOCK <i>et al.</i> <sup>15</sup>	230	6%	94%	-
1977	LANGELAND, BLOCK & GROSSMAN <sup>16</sup>	35	25,7%	74,3%	-
1980	SIMON <sup>17</sup>	35	17%	54%	23%
1980	WINSTOCK <sup>24</sup>	9804	8,4%	-	-
1987	NAIR <sup>18</sup>	31	3,2%	96,8%	-
1988	SHAH <sup>25</sup>	14	35,71%	-	64,3%
1988	STOCKDALE & CHANDLER <sup>7</sup>	1108	16,8%	77,3%	5,9%
1990	NOBURAHA & DEL RIO <sup>21</sup>	150	22%	59%	19%
1990	SPATAFORE <i>et al.</i> <sup>19</sup>	1659	42%	52%	6%
1991	LIN <i>et al.</i> <sup>20</sup>	150	19,3%	-	80,7%
1994	WHITE <i>et al.</i> <sup>22</sup>	55	27%	73%	-
1996	NAIR, PAJAROLA & SCHROEDER <sup>23</sup>	256	15%	50%	35%***

\* sample 1 – 50 cases radiographically diagnosed as cysts. Sample 2 – 50 cases with any type of radiographic lesion.

\*\* In a group of 31 lesions diagnosed as cysts, 10 were diagnosed as mature cysts and 21 as precocious cysts (Hymen in formation). The authors report that some pathologists had misidentified the precocious cysts as granulomas. This would change the percentages of columns 4 and 5 to 9 % of cysts and to 81 % of granulomas.

\*\*\* Cases diagnosed as chronic abscesses.

NATKIN, OSWALD & CARNES<sup>25</sup>, in a review of the literature concerning the relationship of the size of the apical lesion, the incidence and treatment of cysts and granulomas report that the incidence of these lesions may seem to be subjected to many variables which have not been properly controlled in many studies. Aiming at this and at the wide interval among these incidences in the diverse studies, one may conclude that this incidence is still uncertain but that, indeed, could be considered lower a great part of these studies suggest.

According to LANGELAND, BLOCK & GROSSMAN<sup>16</sup>, the unconformity among these studies regarding the prevalence of granulomas and cysts should be considered in relation to the criteria used by each investigator. This way, aspects concerning the histological criteria used for the definition of each periapical pathology, type and characteristic of the sampling population, quantity of lesions examined, way by which this sample was collected, etc, should be criteriously analyzed.

The aim of the present study was to verify the prevalence of the cystic and non-cystic lesions, with varied degrees of abscess severity, in teeth bearing periapical lesions associated to the dental apex at the time of their extraction.

## **MATERIAL AND METHODS**

In this study 113 human teeth were used, which were extracted due to reasons which are unknown to us, associated to great coronary destruction produced by cavities, extensive restorations, coronary fractures with consequent state of necrosis of the pulpal tissue in which it was possible to observe macroscopically, associated to their apexes, the presence of a proliferative tissue compatible with the periapical pathological alteration.

The collection of the referred dental elements occurred in Dental Services, in unions which cater for dental services and in dental offices in the interior of the state of Rio Grande do Sul and Santa Catarina. Plastic containers containing formaldehyde at 10% for conditioning and fixation of the material were distributed in these sites.

Some factor of exclusion such as the presence of lesions, which extended until the cervical of the teeth, teeth which had undergone previous endodontic intervention and cases of incomplete rhizogenesis, were considered. In order to do so, the dental elements were radiographed after their extraction. 15 teeth were discarded, since 13 had previous endodontics and 2 presented incomplete rhizogenesis.

Some characteristics of these samples were written down, such as the dental group in each sample and the size of the periapical lesion, which was measured in millimeters, by means of a millimetrical ruler.

The total number of analyzed teeth in this experiment was 98, from which 6 were biradicular or poliradicular, presenting 2 lesions in each tooth (1 in each root), thus totaling 104 apical lesions.

The apical pathologies were carefully detached manually from the dental element and histologically processed in the Histological Lab of the Lutheran University of Brazil - ULBRA. After the inclusion of the samples in paraffin, semi-serial cuts of 5 micrometers with intervals of 0.5 millimeters were conducted and dyed by means of Harris' Hematoxiline and Alcoholic Eosin. 2 to 9 blades were obtained by sample, depending on the extension of the pathology, which were examined in a Zeiss microscope (Germany), lenses 3,2/0,07, 10/0,22 e 40/0,65, and oculars 10 /18.

The periapical lesions were classified in:

- Non-cystic Lesions:

- Periapical Granuloma – lesions that presented chronic inflammations constituted by granulomatose tissue predominantly infiltrated by lymphocytes, plasmocytes and macrophages, containing or not epithelial residues<sup>23</sup>. In this pathology, the polymorphonuclear neutrophyles were sparsely found, without forming microcavities of abscesses or infiltrated. Around these tissues, one could observe a capsule which was constituted by collagenous fibers.

- Periapical Abscess – Pathologies with focus of acute inflammation characterized by the presence of a distinct collection of polymorphonuclear neutrophyles in the interior of a previously existing granuloma<sup>23</sup>.

According to the gravity or extension of the abscess, these lesions were classified in different degrees.

- Degree 1 Periapical Abscess– when polymorphonuclear neutrophyles which were degenerated or in process of degeneration composed microcavities of abscess comprehending from 1 to 30% of the body of the lesion.

- Degree 2 periapical abscess – when the cavity of the abscess composed from 30 to 60% of the body of the lesion.

- Degree 3 periapical Abscess - when the cavity of the abscess composed more than 60 % of the body of the lesion.

### Cystic Lesions

- Periapical inflammatory Cyst – lesions with a layer of stratified squamous epithelium along one surface of a sufficient amount of the inflammatory tissue consisting by plasmocytes and lymphocytes to indicate that the epithelium actually lined a cavity<sup>6,12-13,21-22</sup>.

- Abscessed periapical Cyst

According to the level of severity and extension of the abscess, as well as with the periapical abscesses, the cysts were discriminated in abscessed cysts of different degrees:

- Degree 1 abscessed cyst – lesion with the same histological characteristics of the periapical cyst, though with collections of disintegrated or in state of degeneration polymorphonuclear neutrophils forming microcavities of abscess with rupture of the epithelial lining. The unfiltered by PMNs and the cavity of the abscess comprehended from 1 to 30% of the body of the lesion and the rest was occupied by the epithelium, chronic inflammatory unfiltered and fibrous capsule, discounting from this value the volume occupied by the cystic cavity.

- Degree 2 abscessed cyst – When the unfiltered by PMNs and the cavity of the abscess comprehended from 30 to 60% of the body of the lesion and the rest was occupied by the epithelium, chronic inflammatory unfiltered and fibrous capsule, discounting from this value the volume occupied by the cystic cavity.

- Degree 3 abscessed cyst – When the unfiltered by PMNs and the cavity of the abscess comprehended more than 60% of the body of the lesion and the rest was occupied by the epithelium, chronic inflammatory unfiltered and fibrous capsule, discounting from this value the volume occupied by the cystic cavity.

The diagnosis of each pathology was conducted by 2 observers previously calibrated and outlined by means of the observance of all the histological cuts. As each of the semi-serial cuts were analyzed, the histological aspect of the lesion would alter, in regards to the presence of the epithelium delimitating a cavity or in the amplitude of the cavity of the abscess. The presence of the epithelium delimitating a pathological cavity in one or more blades of a determined lesion has characterized it as a periapical lesion. Regarding the degree of the abscess, we have considered as a final diagnostic the one of the blade in which it was found in its biggest amplitude or gravity, independently of the fact that the lesion was cystic or non-cystic. Following this exposition, the final diagnosis of each lesion is the one that follows in a decreasing order: degree 3, degree 2, degree 1 abscessed cyst and periapical cyst, followed by degree 3, degree 2 and degree 1 periapical abscess and apical granuloma.

After the diagnostic results of the two observers had been submitted, the periapical lesions were grouped in two subgroups:

- non-cystic lesions (A):

-A 1 – non-cystic lesions with or with a small degree of abscess (periapical granuloma and degree 1 abscess)

-A 2 – non-cystic lesions with advanced degree of abscess (degree 2 and 3 periapical abscess)

- cystic lesions (B):

-B 1 – cystic lesions with or with a minimum degree of abscess (periapical cyst and degree 1 abscessed cyst)

-B 2 – cystic lesions with advanced degree of abscess (degrees 2 and 3 abscessed cysts)

In the cases in which there were controversies concerning the diagnosis between

the two observers, the histological blades were examined once more so that only one diagnosis would be attributed to each pathology.

The Kappa Test was conducted so as to evaluate the degree of agreement between the examiners concerning the diagnosis of the apical lesions.

## RESULTS

The results are expressed in [Tables 2 - 5](#). From the 104 analyzed specimens, 2 were lost during the conduction of the methodology, adding to 102 periapical lesions, originating from 96 teeth.

Table 2 – Dental Group examined

Tooth		Superior	Inferior	Total
Known	Incisive	2	1	3
	Canine	3	1	4
	Pre-molars	5	5	10
	Molars	16	22	38
Unknown				41
Total				96

Table 3 – Size of Periapical Lesions

Diameter of lesion	n
2 - 4 mm	41
4 - 6 mm	42
6 - 8 mm	15
8 ou + mm	4
Total	102

Table 4 – Prevalence regarding the type of periapical lesion

Type of lesion	N	%
A 1*	12	11,8
A 2**	65	63,7%
B 1***	4	3,9%
B 2****	21	20,6%
Total	102	100

\*A1 – non-cystic lesions with absence or small degree of abscess (periapical granuloma and degree 1 abscess)

\*\*A 2 – non-cystic lesions with high degree of abscess ( Degrees 1 and 2 periapical abscess)

\*\*\*B1 – cystic lesions with absence or small degree of abscess (periapical cyst and degree 1 abscessed cyst)

\*\*\*\*B2 – cystic lesions with high degree of abscess (Degrees 2 and 3 abscessed cysts )

Table 5 – Lesions with less severity of abscess (A1 e B1) X Lesions with higher severity (A2 e B2)

Type of lesion	n	%
A 1* + B 1***	16	15,7
A 2** + B 2****	86	84,3%
Total	102	100

\*A1 – non-cystic lesions with absence or small degree of abscess (periapical granuloma and degree 1 abscess)

\*\*A 2 – non-cystic lesions with high degree of abscess ( Degrees 1 and 2 periapical abscess)

\*\*\*B1 – cystic lesions with absence or small degree of abscess (periapical cyst and degree 1 abscessed cyst)

\*\*\*\*B2 – cystic lesions with high degree of abscess (Degrees 2 and 3 abscessed cysts )

The quantity of specimens analyzed in each dental group is summarized in [Table 2](#).

The periapical lesions measured from 2 – 9 mm. The biggest number of lesions analyzed measured from 2 – 6 mm ([Table 3](#)).

The degree of agreement among the observers concerning the diagnostic of periapical lesions measured by the Kappa Test was 96% (ep = 0,07, com IC = 0,82 – 1,0).

The cysts ([fig. 5 - 8](#)) added up to 24,5% of the sample, among which 84% presented high degrees of severity ([fig 7, 8](#)). The most prevalent histological diagnostic was the one of degree 2 periapical ([fig 3](#)) and 3 ([fig 4](#)), i.e., non-cystic lesions with high degrees of abscess, which added up to 63,7% of the sample ([table 4](#)). Periapical granuloma was not a frequent finding ([fig. 1](#)).

If one disregards the cystic characteristic of the lesions and considers only the presence of the abscess in them, one can observe that 86 lesions (84,3%) presented abscess cavities, which occupied a significantly large area of the lesion ([fig. 3, 4, 7, 8](#)). Only 16 lesions (15,7%) presented absence of abscess ([fig 1, 5](#)) or the presence the microcavities reaching small areas of this lesion ([fig 2, 6](#)) ([table 5](#)).

Thus, by classifying the lesions in this way, the observers reached a degree of agreement of 93% among their analyses (K=0,93; ep=0,10, com IC=0,73-1,0).

## DISCUSSION

Although the radiography is undoubtedly an indispensable complement to evaluate the presence of periapical pathologies, the involvement of the structures and the destructive extension of the process<sup>3</sup>, the teeth analyzed in this experiment were not submitted to radiographic exam prior to its exodontics. A reason which supports this practice is the fact that the precise diagnostic of these lesions is just obtained by means of the histological exam<sup>3,13,25,27</sup>. A second reason was the fact that the teeth had been collected mainly in Dental Service, which focus on the

needs of the lower classes, mainly on an emergency basis. In this scenario, the procedure of having radiographs taken prior to the extraction is not a routine practice, due to economical and time constraints. The high level of abscesses (63,7%) with high degrees of severity, in which the cavity occupied more than 30% of the area of the lesion verified in the present study may also be explained by the origin of the referred dental elements, extracted from patients who have opted for the exodontics maybe because they have been suffering from pain and cannot support the execution of an endodontic treatment with the subsequent restoration of its dental element. These findings, disregarding the nomenclature used for each particular lesion, corroborate with the findings by GROSSMAN & ETHER<sup>11</sup> who have classified as periapical granulomas 79,13% of the lesions, among which 56,39% presented some degree of acute reaction.

In the present study, a new classification regarding the extension, i.e., regarding the severity of the abscesses was used, both for the cystic lesions as well as for the non-cystic lesions. Due to the fact that the criteria used for the area which had been occupied by the abscess cavity had caused some doubts among the observers, regarding the discrimination of the diagnostic in particular as compared to the degrees of abscess, it was decided to classify the lesions in subgroups, after they had been primarily classified. These subgroups were named as cystic and non-cystic lesions with minor and major degree of severity.

Another observation in the present study was the almost total lack of periapical granulomas since the presence of abscess microcavities exhibiting polymorphonuclear neutrophiles in degeneration, although in very small portions of the lesion, characterized the presence of the abscess, defining the lesions as such. In this case, one may state that histologically, there are no pure granulomas. Once more we call the attention to the importance of the histological criteria to be employed in the denomination of each type of lesion. The pathologists, in general, define as abscess the presence of zones which are very palely dyed, occupied previously by pus, which is lost during the histological process, involved by PMNs in degeneration. Since antigens, which are processed in the interior of the apical lesion, are constantly emanated from the radicular canal it is easy to understand the existence of focal areas of abscess in the interior of the granulomas. Thus, in this study, they were then classified as degree 1 periapical abscesses, conforming with the concept adopted by the pathologists.

Due to a lack of standardization regarding the histological criteria for the diagnosis of periapical lesions used in most of the studies, a comparison of their results turns out to be a remote one. Nevertheless, the percentage of prevalence of 24,5% of cystic lesions which are referred to in this study is in accordance with the findings of many investigators<sup>3,8,14,16,21-22</sup>.

It might be appropriate to discuss the relevant factors in the procedure of research regarding the diagnosis of periapical lesions, specially the histological criteria used by each investigator to define each periapical pathology in particular. SHAFER, HINE & LEVY<sup>27</sup> define cyst as a pathological cavity limited by epithelial and usually containing fluid or semi-solid material in its interior. According to the use of these definitions, lesions containing epithelium, though not having a space filled by fluid shall not be considered as cystic lesions. This



pattern was followed in others studies<sup>3-4,10-11,14</sup>. The studies by NOBUHARA & DEL RIO<sup>21</sup> and WHITE *et. al.*<sup>22</sup> considered as cysts the lesions with evidence of a lumen totally or partially delimited by scaly stratified epithelium. Others studies<sup>14,18-19,26,28-31</sup> did not clearly explicit the diagnostic criteria used for the classification of periapical lesions. LINENBERG, WALDRON & DELAUNE<sup>3</sup> considered mature cysts, when there was a clear evidence of a central cavity delimited by epithelial tissue, and precocious cysts when the proliferation seemed to be forming a lumen. Nevertheless, lesions with this very characteristic were considered as granulomas with cystic transformation in others studies<sup>6,13</sup>. On the other hand, MORTENSEN; WINTHER & BIRN<sup>5</sup> did not state any specific detail for the classification of the cystic lesions. Notwithstanding, all the lesions analyzed in this experiment exceeded 5 mm in diameter, what may have resulted in a sample with a bias of selection in favor of periapical cysts.

PATTERSON, SHAFER & HEALEY<sup>12</sup>; LALONDE & LUEBKE<sup>13</sup> and LALONDE<sup>6</sup> classified as periapical cysts those lesions in which there was a layer of scaly stratified epithelium along a surface with a sufficient quantity of conjunctive tissue or granulation capable of indicating that the epithelium delimited a cavity.

BLOCK *et. al.*<sup>15</sup> and LANGELAND, BLOCK & GROSSMAN<sup>16</sup> used the definition of cyst defended by SHAFER, HINE & LEVY<sup>27</sup>, in order to classify it as such. Nevertheless, the authors paid particular attention to the epithelial cells adjoining to the empty spaces. Any alteration in the cellular morphology or in the remaining adherent tissue allowed for the classification of the lesion as a true cyst or one in development.

On the other hand, STOCKDALE & CHANDLER<sup>7</sup> diagnosed 16,8% of periapical cysts, when there was evidence of odontogenic epithelium delimiting a surface, even when it was fragmented. When an epithelium in proliferation was seen in the interior of a mass of fibrous tissue, the lesion was recorded as a cyst in development. The diagnosis of cyst was also made in the case of lesions larger than 6 millimeters in diameter, where there was a distinct fibrous capsule with a dense infiltrated inflammatory looking like an infected dental cyst in which the epithelial lining had been destroyed. The authors classified the lesions as granulomas only in those cases in which they did not present any epithelial tissues.

Similarly to the cysts, the granulomas and periapical abscesses also suffer a certain discrepancy regarding the histological criteria used for their classification.

In the studies by LINENBERG, WALDRON & DELAUNE<sup>3</sup>, the criteria for the diagnosis of the granuloma was made based on the presence of a mass surrounded by a chronic inflamed tissue without remarkable central necrosis or lumen formation where the epithelium may be present or not. The diagnosis of chronic periapical abscess was made when the central necrosis and a dense accumulation of polymorphonuclear neutrophiles was seen surrounded by walls of inflamed conjunctive tissue of various thicknesses.

NAIR<sup>18</sup>, after analyzing 31 apical lesions, reported the finding of 30 granulomas

and one radicular cyst, among which 4 granulomas and one cyst were symptomatic. In his discussion, however, 3 of these 4 granulomas, with the exception of one which was a case of periapical actinomycosis, were considered to be Phoenix abscesses developed in response to bacterial invasion in the body of the lesion. Why haven't these lesions been classified immediately as chronic abscesses, since this type of classification, as we shall see, was used by this very author in 1996, when he analyzed 256 apical lesions?

NAIR, PAJAROLA & SCHROEDER<sup>23</sup> have classified as chronic abscesses those lesions where a focus of acute inflammation characterized by a distinct collection of polymorphonuclear neutrophils was present in the interior of an existing granuloma, and these could be epitheliated or not. In almost all of these cases, the areas of acute inflammation were intermingled in granulomas predominantly dominated by lymphocytes and plasmacytes. The granulomas were characterized by the presence of a chronic inflammation that consisted of a granulomatous tissue that was predominantly infiltrated by lymphocytes, plasmacytes, macrophages, which could be epitheliated or not. Concerning the discrimination of the dental abscess, BHASKAR<sup>4</sup> seems to have the same opinion as the author aforementioned, since he reported that these represented granulomas, radicular or residual cysts, which had suffered secondary episodes of acute and sub-acute inflammation. However, the author has not described clearly how the histological status of this particular condition would be.

By means of the description of the studies by GROSSMAN & ROSSMAN<sup>2</sup>; by PATTERSON, SHAFER & HEALEY<sup>12</sup> and by STOCKDALE & CHANDLER<sup>7</sup>, granulomas and chronic abscesses have been conjointly classified.

NOBUHARA and DEL RIO<sup>21</sup> mentioned that there could be errors in the classification of granulomas and periapical cysts when the samples originated from biopsies of the peri-radicular tissue that had been removed by means of surgery, thus influencing the incidence of a lesion on top of the other. Therefore, the curettage of a periapical cyst could result in the rupture of the epithelial lining, and if the fluid or the semi-solid material escaped from the lumen, the cystic cavity could collapse and the specimen could erroneously be diagnosed as granuloma with epithelial proliferation. On the other hand, the curettage of a periapical granuloma could result in the separation of an epithelial proliferation. Similarly, the specimen presenting a strip of the epithelium partially delimiting an incomplete cavity could also be erroneously diagnosed as periapical cyst. Thus, for the authors, the pathological diagnosis of any specimen requires serial sections so as to guarantee its reliability.

In the same manner, one should also observe the number of blades for each analyzed lesion, as well as the different positions or cut heights of the lesions, so as to be precise with more reliability the diagnosis among the different types of periapical lesions. Concerning these, there are literary files where one can see that semi-serial cuts of the lesions were performed<sup>15-16</sup> or, depending on the case, semi-serial and serial cuts of the lesion<sup>23</sup>. Other studies did not mention the number of sections or blades used for the diagnosis of the lesions<sup>4,7,10-12,14,19,22,26,30-31</sup>. BOHNE<sup>31</sup> stated that the diagnosis of the lesions was performed in just half of the lesion, since the other half was used for other purposes. Authors<sup>17,20</sup> reported

the performance of serial cuts in representative sections of the lesion.

In this respect, serial cuts without intervals of all the lesion are indispensable in research regarding cellular quantification, and they are dispensable in cases where just the differential diagnosis of the lesion is aimed at. However, the analysis of the histological findings demonstrated by just one histological blade could distort the diagnosis, even if one was careful in taking the most central portion of the lesion as a basis, since one cavity delimited by epithelium, which is an aspect that characterizes the existence of a periapical cyst, could be dislocated to another side of the lesion. Moreover, LINENBERG, WALDRON & DELAUNE<sup>3</sup> have reported that the use of multiple sections used in his studies have emphasized the narrow relationship among chronic abscesses, granulomas and cysts, and called the attention to the fact that many of the aspects of the three types of lesions suggested transitions from one to the other.

When we find an already installed granuloma or periapical cyst, a variation in the type of process stimulus may produce a modification in the scenario, resulting in its severity, i.e., in the formation of a periapical abscess. These lesions have been denominated as abscessed granulomas and abscessed cysts, respectively, though there are controversies as to the use of this nomenclature, mainly concerning the abscessed granuloma, which, for the pathologists, would be better described as periapical abscess. Thus, in a periapical lesion, variations may be detected not only in determined time intervals, but at the same time, in the same process, allowing for the observation of a classic chronic reaction in one area and the beginning or end of an acute reaction in another<sup>10-11</sup>. Thus, the performance of semi-serial cuts of all the periapical lesion, a methodology adopted by the authors, is of utmost importance.

Concerning the method used for obtaining the sampling population, we highlight the surgical removal of the lesions by means of endodontic surgical techniques<sup>2,7,10-12,14-16,19-22,26,29</sup>, the removal in block of the dental piece conjointly with the periapical lesion and adjoining bone structures<sup>28</sup> and by means of the obtainment of periapical lesions through exodontics, when these are associated to the radicular apex<sup>3,17-18,23,31</sup>, or still if these are curetted after the extraction. LINENBERG, WALDRON & DELAUNE<sup>3</sup>, have also used the criteria of the association of the lesion to the radical apex after its exodontics so as to clinically classify these cystic lesions. Nevertheless, when the latter remained in the alveolus, they were after curetted. For the authors, when a lesion was radiographically well defined and was removed together with the tooth or easily curetted from the alveolus, it was diagnosed as a cyst, independently of its size. When the pathology was not removed so easily as a cyst the lesion was clinically designated as granuloma. If a diffused radiolucid area appeared in the radiograph and a considerable curettage was needed to remove the apical tissue, the lesion was diagnosed as abscess. The validity of this criteria should be questioned, once it is practically impossible to measure or standardize the easiness or difficulty of a curettage of the alveolus.

WALTON & GARNICK<sup>32</sup> stated that a problem with the use of biopsy for the classification of periapical lesions may be the loss of randomization, i.e., certain regions of the inflammatory lesion as well as certain clinical conditions could be

avored, since the surgery is frequently performed due to a failure in the endodontic treatment or because the conventional treatment is not possible. Moreover, the biopsy could be considered a bias of the sampling of the large lesions, since the surgical treatment is selected for these cases, whereas smaller lesions are solved by a conventional endodontic treatment, and are not selected for biopsies. Going further in their explanations, the authors also commented that the histological exam of the periapical lesions which embrace the radicular apex when the tooth is extracted might also represent a selected sample, due to the fact that only these type of lesions, which embrace the radicular apex could be examined. The authors argued that the preferred method, mainly for descriptive studies of the periapical endodontic pathology, should be the study of the biopsies of all the soft and hard tissue extracted from the periapical regions in blocks. Nevertheless, the viability of these studies, mainly in humans, becomes practically remote, due to the fulfillment of ethical principles. However, when the objective is simply the histopathological classification of the periapical lesion, it is commonsense to use just the soft tissue adjoining to the radicular apex<sup>4,13,15-17,29-30</sup>.

In addition to the numerous factors aforementioned, regarding the discrepancies in the results of research in relation to the prevalence of granulomas and apical cysts, it is important to highlight that some studies used teeth without previous endodontic intervention<sup>3,14,17-18,23</sup>, or when the majority of the specimens (94%) did not present this characteristic<sup>13</sup>, whereas others employed samples of teeth with or without endodontic treatment, without quoting percentages of occurrence of these conditions<sup>4,12</sup>. In PATTERSON, SHAFER & HEALEY's<sup>12</sup> study, although the authors have mentioned in their results that the teeth investigated were endodontically treated, we could verify that some conditions should exist so that the periapical surgery could be conducted. Among them we could name canals with calcic degeneration or existence of anatomic conditions which did not allow their adequate sealing. Therefore, not all the teeth examined had their radicular canals really treated. However, in others studies<sup>7,15-16,20-21,26</sup> the endodontic treatment was performed previously, whereas this criteria was not referred to by SPATAFORE *et al.*<sup>19</sup> and WHITE *et al.*<sup>22</sup>.

Due to the limitations described above, we corroborate with SPATAFORE *et al.*<sup>19</sup> and NOBUHARA & DEL RIO<sup>21</sup>, who have questioned the viability of the comparison between the reports of incidence of peri-radicular pathologies presented in the literature, with the belief that this would be of little value.

In terms of endodontic clinical practice, the knowledge of the prevalence of a type of periapical pathology over the other resides in the fact that there is a belief that the many periapical cysts are not cured after the realization of conventional endodontic therapy<sup>24</sup>. However, there are studies which indicate that the conventional endodontic treatment allows for the radiographic disappearance of periapical lesions in 85 – 90% of the cases, or for at least, a decrease in their sizes<sup>33-35</sup>. Based on these clinical observations and on some histopathological studies<sup>1,4,13</sup> it has been assumed that the majority of the cystic lesions are cured after the endodontic treatment. Some authors relate to the type of cyst its capacity to repair itself after the endodontics. According to SIMON<sup>17</sup>, the cyst bay-type would cure with more probability than a true cyst, which has a self-sustainable tissual dynamics, i.e., the lesion is independent from the presence or absence of

irritating substances in the interior of the radicular canal<sup>36</sup>. Thus, the true cysts, mainly the bigger ones, would be less probable to be solved after the endodontic therapy. This has been shown recently in a longitudinal study of preservation of cystic lesions treated endodontically<sup>37</sup>.

Nevertheless, today one accepts that the paraendodontic surgery is indicated just for cases when the non-surgical therapy has failed to repair and the re-treatment is not indicated or improbable to improve the prognostics of the case<sup>21</sup>.

## CONCLUSIONS

Based on the methodology employed in the present study, we may come to the following conclusions:

- Cystic lesions add to approximately 24,5% of the periapical pathologies associated to the necrosis of the radicular canal;
- The majority of the chronic periapical lesions (84,3%), independent of the fact that they are cystic (20,6%) or non-cystic (63,7%), show severe degrees of abscess.

## BIBLIOGRAFY

1. PRIEBE, W. A., LAZANSKY, J. P., WUEHRMANN, A. H. The Value of the Roentgenographic Film in the Differential Diagnosis of Periapical Lesions. *Oral Surg Oral Med Oral Pathol* 1954, 7: 979-983.
2. GROSSMAN, L. I., ROSSMAN, S. R. Correlation of Clinical Diagnosis and Histopathologic Findings in 101 Pulpless Teeth With Areas of Rarefaction. *J Dent Res* 1955, 34: 692 (abstract 60)
3. LINENBERG, W. B., WALDRON, C. A., DELAUNE Jr, G. F. A clinical, roentgenographic, and histopathologic evaluation of periapical lesions. *Oral Surg Oral Med Oral Pathol* 1964, 17: 467-472.
4. BHASKAR, S. N. Periapical Lesions Types, Incidence and Clinical Features. *Oral Surg Oral Med Oral Pathol* 1966, 21: 657-671.
5. MORTENSEN, H.; WINTHER, J. E.; BIRN, H. Periapical Granulomas and Cysts: An Investigation of 1600 Cases. *Scand J Dent Res* 1970, 78: 241-250.
6. LALONDE, E. R. A new rationale for the management of periapical granulomas and cysts: an evaluation of histopathological and radiographic findings. *J Am Dent Assoc* 1970, 80: 1056-1059.
7. STOCKDALE, C. R.; CHANDLER, N. P. The nature of periapical lesion – a review of 1108 cases. *J Dent Res* 1988, 16: 123-129.

8. BAUMANN, L., ROSSMAN, S. R. Clinical roentgenologic and histopathologic findings in teeth with apical radiolucent areas. *Oral Surg.Oral Med Oral Pathol* 1956, 9: 1330-1336.
9. WAIS, F. T. Significance of Findings Following Biopsy and Histologic Study of 100 Periapical Lesions. *Oral Surg Oral Med Oral Pathol* 1958, 11: 650-653.
10. GROSSMAN, L. I.; ETHER, S. S. Estudo Comparativo Clínico e Histológico Patológico de Reações Periapicais Crônicas – 1ª parte. *Rev Bras Odont* 1963, 23: 226-237.
11. GROSSMAN, L. I.; ETHER, S. S. Estudo Comparativo Clínico e Histológico Patológico de Reações Periapicais Crônicas – 2ª parte. *Rev Bras Odont* 1963, 22: 286-295.
12. PATTERSON, S. S.; SHAFER, W. G.; HEALEY, H. J. Periapical Lesions. *J Am Dent Assoc* 1964, 68: 191-194.
13. LALONDE, E. R.; LUEBKE, R. G. The frequency and distribution of periapical cysts and granulomas. *Oral Surg Oral Med Oral Pathol.* 1968, 25: 861-868.
14. MORSE, D. R.; PATNIK, J. W.; SCHACTERLE, G. R. Electrophoretic differentiation of radicular cysts and granulomas. *Oral Surg Oral Med Oral Pathol* 1973, 35: 249-264.
15. BLOCK, R. M.; BUSHELL, A.; RODRIGUES, H.; LANGELAND, K. A histopathologic, histobacteriologic, and radiographic study of periapical endodontic surgical specimens. *Oral Surg Oral Med Oral Pathol* 1976, 42: 658-678.
16. LANGELAND, K.; BLOCK, R. M.; GROSSMAN, L. I. A histopathologic and histobacteriologic study of 35 periapical endodontic surgical specimens. *J Endod* 1977, 3: 8-23.
17. SIMON, J. H. S. Incidence of periapical cysts in relation to the root canal. *J Endod* 1980, 6: 845-848.
18. NAIR, R. Light and Electron Microscopic Studies of Root Canal Flora and Periapical Lesions. *J Endod* 1987, 13: 29-39.
19. SPATAFORE, C. M.; GRIFFIN Jr, J. A.; KEYES, G.G.; WEARDEN, S.; SKIDMORE, A. E. Periapical Biopsy Report: An Analysis over a 10-year period. *J Endod* 1993, 16: 239-242.
20. LIN, L. M.; PASCON, E. A.; SKRIBNER, J.; GÄNGLER, P.; LANGELAND, K. Clinical, radiographic and histologic study of endodontic treatment failures. *Oral Surg Oral Med Oral Pathol* 1991, 71: 603-611.
21. NOBUHARA, W. K.; DEL RIO, C. E. Incidence of Periradicular Pathoses in

Endodontic Treatment Failures. *J Endod* 1993, 19: 315-318.

22. WHITE, S. C.; SAPP, P.; SETO, B. G.; MANKOVICH, N. J. Absence of radiometric differentiation between periapical cysts and granulomas. *Oral Surg Oral Med Oral Pathol* 1994, 78: 650-654.

23. NAIR, P. N. R.; PAJAROLA, G.; SCHROEDER, H. E. Types and incidence of human periapical lesions obtained with extracted teeth. *Oral Surg Oral Med Oral Pathol* 1996, 81: 93-102.

24. WINSTOCK, D. Apical disease: an analysis of diagnosis and management with special reference to root lesion resection and pathology. *Ann R Coll Surg Engl* 1980, 62: 1171-1179.

25. NATKIN, E.; OSWALD, R. J.; CARNES, L. The relationship of lesion size to diagnosis, incidence, and treatment of periapical cysts and granulomas. *Oral Surg Oral Med Oral Pathol* 1984, 57: 82-94.

26. SHAH, N. Nonsurgical management of periapical lesions: A prospective study. *Oral Surg Oral Med Oral Pathol* 1988, 66: 365-371.

27. SHAFER, S.; HINE, M.K.; LEVY, B.M. Diseases of the Pulp and Periapical Tissues. In:\_\_\_\_\_ A textbook of oral pathology. Philadelphia: W.B. Saunders; 1974. p.440-446.

28. HENRY, J. L.; WEINMANN, J. P. The pattern of resorption and repair of human cementum. *J Am Dent Assoc* 1951, 42: 270-290.

29. STERN, M. H.; DREIZEN, S.; MACKLER, B. F.; SELBST, A. G.; LEVY, B. M. Quantitative analysis of cellular composition of human periapical granuloma. *J Endod* 1981, 7: 117-122.

30. DELZANGLES, B. Scanning Electron Microscopic Study of Apical and Intracanal Resorption. *J Endod* 1989, 15: 281-285.

31. BOHNE, W. Light and ultrastructural studies of human chronic periapical lesions. *J Oral Pathol Med* 1990, 19: 215-220.

32. WALTON, R. E.; GARNICK, J. J. The histology of Pariapical Inflammatory Lesions in Permanent Molars in Monkeys. *J Endod* 1986, 12: 49-53.

33. KEREKES, K.; TRONSTAD, L. Long-term results of endodontic treatment performed with standardized techniques. *J Endod* 1979, 5: 83-90.

34. BARBAKOW, F. H.; CLEATON-JONES, P. E.; FRIEDMAN, D. Endodontic treatment of teeth with periapical radiolucent areas in general dental practice. *Oral Surg Oral Med Oral Pathol* 1981, 51: 552-559.

35. SJOGREN, U.; HUGGELUND, B.; SUNDQVIST, G.; WING, K. Factors affecting the long-term results of endodontic treatment. *J Endod* 1990, 16: 498-

504.

36. SIMON, J. H. S. Patologia Periapical. In: COHEN, S.; BURNS, R. C. Caminhos da Polpa. Rio de Janeiro: Ed. Guanabara Koogan; 1994. p. 338-363.

37. NAIR, P. N. R.; SJOGREN, U.; SCHUMACHER, E.; SUNDQVIST, G. Radicular cysts affecting a root filled human tooth: a long-term post-treatment follow-up. *Int Endod J* 1993, 26: 225-233.

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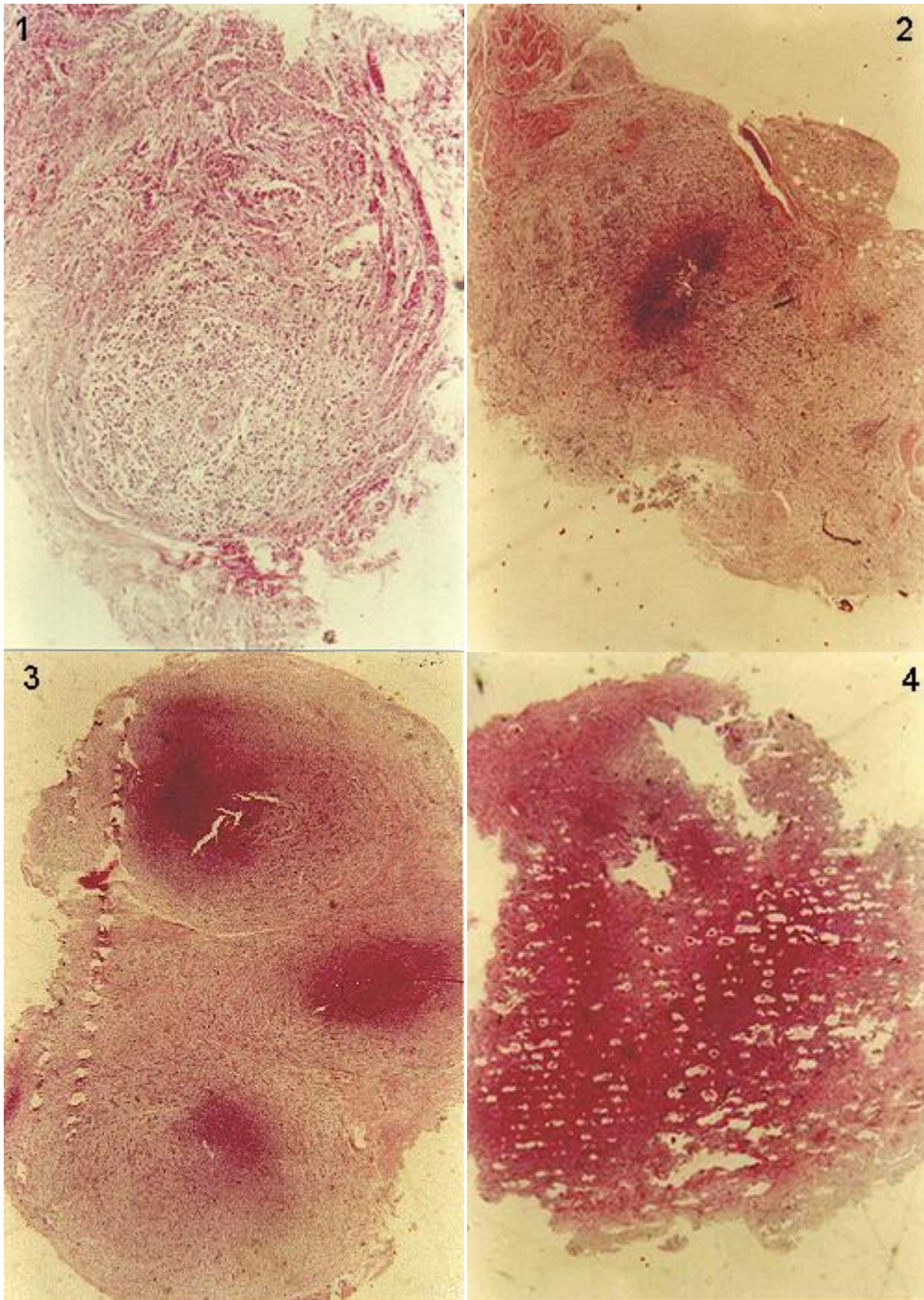
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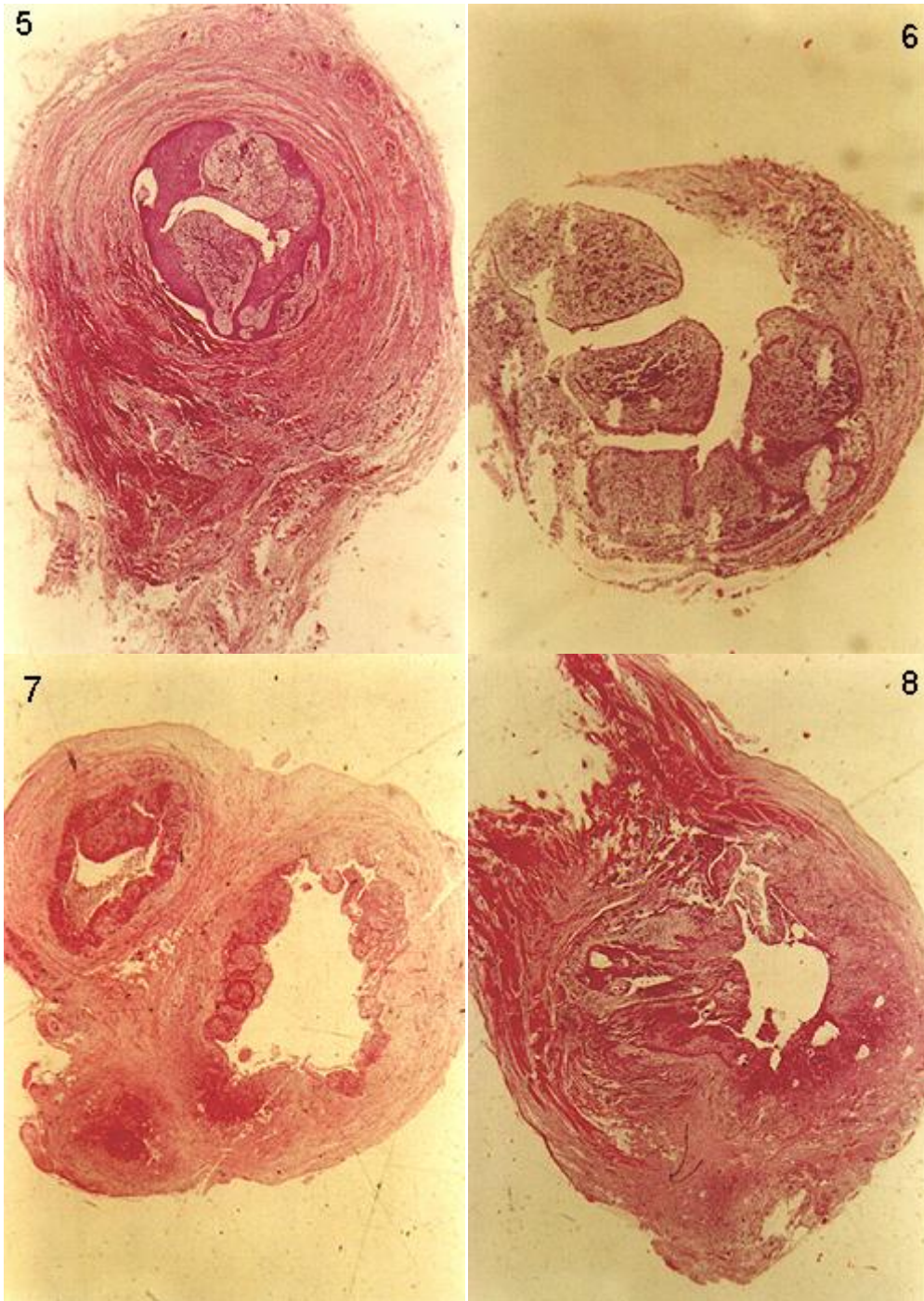
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**Figures: 1** – periapical granuloma (non-cystic lesions with absence of abscess), Original magnification: X 50; **2** – Degree 1 periapical abscess (non-cystic lesions with small degree of abscess). Original magnification: X 20; **3** – Degree 2 periapical abscess (non-cystic lesions with high degree of abscess). Original magnification: X 16; **4** – Degree 3 periapical abscess (non-cystic lesions with high degree of abscess). Original magnification: X 16



**Figures: 5** – periapical cyst (cystic lesions with absence of abscess). Original magnification: X 32; **6** – degree 1 abscessed cyst (cystic lesions with small degree of abscess). Original magnification: X 25; **7** – degree 2 abscessed cyst (cystic lesions with high degree of abscess). Original magnification: X 12; **8** – degree 3 abscessed cyst (cystic lesions with high degree of abscess). Original magnification: X 12.