

RETROSPECTIVE FROM THE LITERATURE ON THE CLINICAL IMPLICATIONS OF ENDODONTIC TREATMENT IN THE PREVENTION AND CURE OF PERIAPICAL LESIONS

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ABSTRACT

This study is a review of the literature to obtain a topical retrospective on the clinical implications of endodontic treatment in the prevention and cure of periapical lesions. To carry out this study, a number of 50 books and specialty articles were studied (see bibliography).

Non-surgical and surgical endodontic treatments have a high success rate in treating and preventing apical periodontitis when performed in accordance with standard and accepted clinical principles. However, periapical endodontic lesions remain in some cases an additional treatment to be considered when apical periodontitis persists. (1)

Periapical lesions of endodontic origin are common pathological diseases that affect the periradicular tissues. Microbial infection of the pulpal tissues is primarily responsible for the onset and progression of apical periodontitis. (2)

Evaluation of the healing of periapical lesions should be done periodically, which requires long-term follow-up. Even large periapical lesions and retreatment cases in which the lesion is of endodontic origin have been successfully managed non-surgically with orthograde endodontic therapy. (2)

Keywords: periapical lesions, root canal therapy, non-surgical management.

INTRODUCTION

Periapical lesions are one of the common pathological conditions that affect periradicular tissues. Microbial invasion and subsequent infection of the root canal systems play a decisive role in the initiation and progression of periapical lesions. (2)

Root canal infection

The dental pulp is a sterile connective tissue protected by enamel, dentin and cement. Significant damage to the pulp chamber leads to inflammation and can lead to pulpal necrosis if left untreated. Possible scenarios that can lead to periapical radiolucency are usually initiated by either trauma, tooth decay or wear and tear (3). Microorganisms could colonize the pulp

tissue after losing their blood supply as a consequence of trauma, leading to periradical pathology. Microbial aggregation or its by-products can infiltrate periradicular tissues and stimulate the host's defense system, leading to destruction of periapical / periradicular tissue (4). Periapical lesions are one of the common pathological conditions that affect periradicular tissues.

Researchers have shown over time that large periradicular lesions can respond positively to non-surgical endodontic treatment. Different techniques can be used in the non-surgical management of periapical pathologies, namely, orthograde root canal therapy, decompression technique, method using calcium hydroxide, suction-irrigation technique, lesion sterilization and repair therapy, active non-surgical decompression and technique apexum procedure. (2)

Evaluation of the healing of periapical lesions should be done periodically, which requires long-term follow-up. Even large periapical lesions and retreatment cases in which the lesion is of endodontic origin have been successfully managed non-surgically with orthodontic endodontic therapy (2). A non-surgical approach should always be taken as a routine measure in periapical lesions of endodontic origin. Conservative orthodontic

endodontic therapy demonstrates favorable results.

PURPOSE OF THE STUDY

The review of the literature aimed to evaluate both the clinical implications of an endodontic treatment in the prevention of periapical lesions and the long-term evaluation of their cure. Evaluation of the healing of periapical lesions should be done periodically, which requires long-term follow-up. Even large periapical lesions and retreatment cases in which the lesion is of endodontic origin have been successfully managed non-surgically with orthograde endodontic therapy.

MATERIAL AND METHOD

In order to carry out this study, a retrospective of the specialized literature was necessary, being involved in the study a number of 50 articles and books, these being mentioned in the bibliography. Electronic databases, such as PubMed, ScienceDirect and Google Scholar, were also browsed using keywords: periapical lesions, root canal therapy, non-surgical management. After reviewing the abstracts, the full text was accessed for the relevant articles.

RESULTS AND DISCUSSIONS

Periapical lesions of endodontic origin are discovered on routine radiographic

examination. They are usually periapical cysts, granulomas or abscesses. There is a fragile balance between the host's defense mechanisms and microorganisms. A change can lead to intense variations from the type of pathogens that proliferate to the type of pathologies encountered. The inflammatory response of the host's defense mechanisms to the presence of microorganisms and microbial by-products in the root canal space eventually leads to apical periodontitis. (2)

The main goal of endodontic therapy should be to restore the teeth involved in a state of normalcy using non-surgical management techniques. All periapical inflammatory lesions should be treated initially with conservative procedures (5). When intra- or extra-root infections are persistent and periapical pathology fails to resolve according to non-surgical endodontic management protocols, only then should a surgeon-wedge option be considered (6).

Periapical or periradicular lesions are barriers that restrict microorganisms and prevent their spread to surrounding tissues; microorganisms induce periapical lesions, mainly or secondary (7, 8). The bone is resorbed, followed by replacement with granulomatous tissue and a dense wall of polymorphonuclear leukocytes (PMN).

Only a limited number of endodontic pathogens can penetrate these barriers; however, microbial products and toxins are able to penetrate these barriers to initiate and establish periradicular pathologies. Periapical radiotransparencies are the most common clinical signs of these lesions (9). Most periapical lesions heal after meticulous non-surgical endodontic treatments (10, 11). In order to assess the healing potential, at least a period of 6 (10) to 12 months (10) after root canal treatment should be considered. It was reported that at the 6-month visit, only half of the cases that eventually heal showed signs of healing (advanced and complete healing), and at the 12-month interval, 88% of these lesions showed signs of healing while are complete healing of the PA lesion could take up to four years in some cases (10).

Differential diagnosis of different types of periapical lesions related to endodontics

The predominance and prevalence of inflammatory changes, such as granulomas and periapical cysts induced by root canal infection, were assessed by researchers by examining periapical biopsy specimens. (1), (13). Although several methods have been proposed, such as periapical radiographs (14), contrast media (15), Pap smears (16), real-time ultrasound imaging (17) and albumin tests (18), these have been proposed. proved inaccurate.

Although postoperative histopathological examination remained the standard for assessing the nature of the lesion (20-22), the use of other imaging systems, such as conical beam computed tomography (CBCT) with high specificity and excellent accuracy, may increase the chance of a preoperative diagnosis. pre-cis (1), (19).

Cone beam computed tomography (CBCT) was specially designed to produce undistorted three-dimensional information of the maxillofacial skeleton, including the surrounding teeth and tissues, with a significantly lower effective radiation dose compared to computed tomography. computerized (CT). We can better detect the periapical points of view, the size, nature, extent and position of periapical pathology. We can also evaluate the root fractures, the nature of the root canal anatomy, the topography of the alveolar bone around the teeth. (23)

CBCT imaging has the ability to detect small areas of periapical pathology before it is evident on 2D radiographs [24], as well as to differentiate areas of larger periapical radiolucency that are indistinguishable from normal variations in bone density. This finding was validated in clinical trials in which periapical periodontitis detected on intraoral radiographs and CBCT was 20% and 48%, respectively [25]. In a 1-year post-treatment

study by the same authors, the absence of periapical radiolucency was found in 93% of cases when assessed by 2D radiographs, but only 74% when using CBCT (24), [26]. Ex vivo studies in which simulated periapical lesions have been created have shown similar findings (24), [27, 28].

In one specialty study, 45 teeth were from 45 patients who met the inclusion criteria and agreed with the clinical trials and were diagnosed with peri-apical lesions with a periapical index score ≥ 3 . Patients were treated with a standardized treatment protocol, including instruments at an apical diameter of # 20 without enlarging the orifice, the GentleWave procedure, and the warm vertical filling. Clinical signs and radiographic evaluations were evaluated at 12 months to assess healing. Success was classified as healing or healed and represented the cumulative success rate of healing. Statistical analyzes were performed using Fisher's exact test, Pearson correlation, and multivariate logistic regression analyzes. (29) At 12 months, 44 out of 45 teeth (97.8%) were evaluated. The cumulative success rate for the GentleWave procedure was 97.7%. Forty-three of the 44 teeth were fully functional; all teeth had full resolution for measured signs of mobility, soft tissue damage, sinus tract, and fork involvement.

Post-treatment periapical lesions present at 1 year after treatment may heal in the second year or later. The aim of this study was to evaluate the volumetric changes of the second year of post-treatment periapical radiolucencies detected at 1 year after treatment. (30)

In a similar study, we were shown that for untreated root canals, they can have a direct impact on the prognosis of root canal treatment. The aim of this cross-sectional study was to evaluate the association of failed canals with periapical lesions in endodontically treated teeth.

The prevalence of omitted canals was 12.0%, and teeth with untreated canals were associated with periapical pathology in 82.6% of cases. The root with the highest percentage of omitted channels (62.8%) was the mesiovestibular root of the first maxillary molar, being associated with periapical lesions in 75.2% of cases. Maxillary molar mesiovestibular roots showing a failed canal were 3.1 times more likely to be associated with periapical pathology than maxillary molars with all channels identified and treated (31). Following this study, it was shown that these untreated endodontic canals have a significant impact on the prognosis of treatment, being also associated with the appearance of periapical lesions.

Another study showed the influence of endodontic treatment on periapical cyst.

Periradicular cysts come from the remains of Malassez's epithelial cells in the alveolus. These cells proliferate due to periapical inflammation induced by infection of the root canal system. (1), (32) most commonly found at the apexes of the teeth involved, but can also be found on the lateral aspects of the roots in relation to the lateral accessory root canals. [33] Their size may regress, remain static or increase and may be found when periapical intraoral radiographs (IOPA) of nonvital pulp teeth are taken; as a round or even unilocular radiolucent lesion. [34] The cyst may move adjacent teeth or cause slight root resorption. Different treatment modalities available for the management of localized root cyst. For small lesions, conventional root canal therapy alone is sufficient, but if the lesion is large, endodontic therapy should be associated with surgery, such as enucleation or marsupialization or decompression, as cited in the report by Narula et al. . [33] Although opinion varies among professionals, some opt for conservative endodontic therapy, while others prefer surgery. However, surgery can have its own disadvantages, such as patient restraint and discomfort, devitalization of the adjacent tooth, loss of bone support, or sometimes paresthesia. [35]

Two types of periradicular cysts have been defined: true cysts, with cavities that are

completely closed by an epithelial lining, and “golf” cysts or “pocket” cysts, with epithelial-lined cavities that communicate with the root canals (36). A study of 256 periapical lesions reported that 15% were periapical cysts, of which 9% were true cysts and 6% were pocket cysts (37).

Unlike true cysts, which are self-sufficient due to their independence from root canal irritants (38), pocket periapical cysts and granulomas can be cured after non-surgical treatment of the root canal. In contrast, it is believed that a true periapical cyst is less likely to heal after non-surgical treatment of the root canal and may require periradicular surgery (1), (39). For more than three years, follow-up studies have shown that approximately 13% of postoperative apical lesions were true cysts (40, 41). The prevalence of cysts from apical periodontitis lesions has been reported to be <20% (37, 36). The growth rate of periradicular cysts is usually slow, centrifugal and infiltrative (42). It is not very large and patients do not feel pain, unless there is an episode of acute inflammatory exacerbation. Lesions are usually discovered during routine radiographic examinations. When exacerbated, the cysts enlarge with some symptoms, including tumors, mild sensitivity, tooth mobility and movement. The results of the pulp sensitivity test are negative (1), (39). Persistent outflow of microorganisms and their

by-products from within the cystic lumen could be responsible for the persistence of periradicular inflammation in properly treated root canal systems (43, 44).

Lesions of apical periodontitis, whether they are granulomas, abscesses or cysts, fail to heal after non-surgical treatment of the root canal for the same reason, intraradicular and / or extraradicular infection. If the microbial etiology of large periapical lesions resembling the cyst and true inflammatory apical cysts in the root canal is eliminated by non-surgical root canal therapy, the lesions could regress through the apoptosis mechanism in a manner similar to the resolution of inflammatory pocket cysts. apical. To achieve a satisfactory healing of periapical wounds, surgical removal of a true apical cyst must include removal of the root canal infection. (45).

It is possible to differentiate a cyst from a granuloma by density, using a CT scan (21). A cyst screening method based on specific CBCT radiological criteria (46) has also been proposed as a preoperative screening tool with 90.8% specificity and favorable sensitivity (58%) (19). A gray matter correction technique was also applied to assess treatment outcomes (47). Granulomas are usually composed of solid soft tissue, while cysts have a semi-solid, liquefied cystic area. Therefore, the less dense area of the radiographic lesion should be

measured to correctly diagnose these lesions. The measurement of the gray value makes it possible to differentiate between soft tissues and fluid or hollow areas (1), (47).

A periapical abscess has similar characteristics to periapical granulomas and peri-apical cysts with a varying degree of peripheral cortex, which makes it difficult to distinguish between them (47). Although histopathological evaluation is the definitive method of differentiating periapical radiolucencies of endodontic origin, it is rarely performed because these diseases are often resolved with non-surgical endodontic treatment; therefore, differentiation between a granuloma and a cyst is not always necessary. The treatment of all three of these lesions is either (re) treatment of the root canal, periradicular surgery or extraction, or a combination of them (48).

Another study showed a patient with a large periapical lesion that was related to the central and lateral incisors of the right jaw. During the conservative treatment of the root canal, aspiration of the fluid was done through the root canal, followed by the placement of a triple antibiotic paste for two weeks. Complete periapical healing was observed at 24-month recall. This report confirms that for the treatment of a large periapical lesion it is not always necessary to perform surgical treatment

and even periapical lesions similar to cysts can be cured following conservative endodontic therapy. (49)

Regarding the influence of various factors that may affect the outcome of root canal therapy, in another study it was evaluated in 356 patients 8-10 years after treatment. The results of the treatment were directly dependent on the preoperative condition of the pulp and periapical tissues. The success rate for cases with vital or non-vital thighs, but which do not have periapical radiolucency, exceeded 96%, while only 86% of cases with pulpal necrosis and periapical radiolucency showed apical healing. The possibility of instrumenting the root canal along its entire length and the level of root filling significantly affected the treatment result. Of all the periapical lesions present on the teeth previously filled with roots, only 62% healed after retreatment. The predictability from clinical and radiographic signs of the treatment result in individual cases with cases of preoperative periapical lesions proved to be low. Thus, factors that have not been measured or identified may be critical to the outcome of endodontic treatment. (50)

CONCLUSION

The ultimate goal of endodontic therapy should be to restore the teeth involved to a state of health and function without surgery. All

periapical inflammatory lesions should be treated initially with non-surgical conservative procedures. Surgery is recommended only after non-surgical techniques have failed. In addition, surgery has many disadvantages, which limit its use in the management of periapical lesions.

There are several new treatment options available for eliminating periradicular lesions

or improving the healing process to save teeth with persistent periapical lesions. It is recommended that, with technological advances, other minimally invasive approaches be considered to address the problem of persistent apical periodontitis and true cysts to reduce the burden on patients.

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