EVALUATION OF SUCCESSFUL ENDODONTIC TREATMENT IN NECROTIC TEETH IN A SINGLE SESSION: A LITERATURE REVIEW

AVALIAÇÃO DO SUCESSO DO TRATAMENTO ENDODÔNTICO EM DENTES NECRÓTICOS EM ÚNICA SESSÃO: UMA REVISÃO DE LITERATURA

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ABSTRACT

Little is discussed in the literature about the indication of biopulpectomy in a single session, however, when it comes to necropulpectomy, there are still discussions about it. Therefore, the objective of this work is, through a literature review, to evaluate the success of endodontic treatment of necrotic teeth in a single session. The literature review was carried out by searching the PubMed and Google Scholar databases in May and June 2020. Relevant articles were selected from the endodontic treatment of necrotic teeth in a single session, published between 2000 and 2020. Of the 30 selected articles, fifteen were literature reviews, six were in vivo studies and three were in vitro studies. In the in vivo studies, five were performed in humans and obtained satisfactory results in the filling in a single session. And in vitro studies have demonstrated the antibacterial effect, which is important for the success of endodontic treatment. Therefore, when well executed, it is possible to obtain success in the endodontic treatment of necrotic teeth in a single session, even in cases associated with chronic periapical lesions.

KEYWORDS: Endodontics; dental pulp necrosis; dental pulp cavity.

RESUMO

Pouco se discute na literatura sobre a indicação da biopulpectomia em sessão única, porém, quando se trata de necropulpectomia, ainda há discussões a respeito. Portanto, o objetivo deste trabalho é, por meio de uma revisão de literatura, avaliar o sucesso do tratamento endodôntico de dentes necrosados em sessão única. A revisão da literatura foi realizada por meio de busca nas bases de dados PubMed e Google Scholar nos meses de maio e junho de 2020. Foram selecionados artigos relevantes do tratamento endodôntico de dentes necrosados em sessão única, publicados entre 2000 e 2020. Dos 30 artigos selecionados, quinze foram revisões de literatura, seis eram estudos in vivo e três eram estudos in vitro. Nos estudos in vivo, cinco foram realizados em humanos e obtiveram resultados satisfatórios no preenchimento em uma única sessão. E estudos in vitro demonstraram o efeito antibacteriano, importante para o sucesso do tratamento endodôntico. Portanto, quando bem executado, é possível obter sucesso no tratamento endodôntico de dentes necrosados em sessão única, mesmo em casos associados a lesões periapicais crônicas.

PALAVRAS-CHAVE: Endodontia; necrose da polpa dentária; cavidade da polpa dentária.

1. INTRODUCTION

For many decades, there was only one endodontic treatment alternative for teeth with pulp necrosis, which was performed in multiple sessions[1]. However, with the advancement of scientific research and the implementation of new techniques in endodontics, it was discovered that this was not the only effective treatment option[2]. A new concept of endodontic treatment for necrotic teeth emerged, which could be performed in a single clinical session, based on the scientific literature[1-5].

Historically, endodontic treatment in a single session has been reported since the end of the 19th century[1,6]. As at that time the techniques were less sophisticated, materials scarce, and scientific knowledge limited, the success rate of these treatments became low[5]. Over the years, new studies were carried out showing that the removal of necrotic content by widening and cleaning the root canal provided a significant improvement in the root canal infection[1,5]. However, there are still many disagreements today. Ideas on this topic, which makes the literature controversial, with authors who defend the single session on the one hand and authors who criticize it on the other[3-6].

Advocates claim that single session necro pulpectomy offers numerous advantages, such as: it reduces the number of visits to the dentist, avoids the need for repeat anesthesia and absolute isolation, decreases the risk of bacterial recontamination between sessions, allows greater savings for the endodontist and

for the patient, in addition to returning the tooth to its function and aesthetics more quickly[4]. Critics, on the other hand, claim that it is not possible to perform the total disinfection of the root canal system in just one session. These defend the idea that it is only It is possible to completely exterminate existing bacterial colonies in the root canal, if an intracanal medication is used after the chemical-mechanical preparation, which must be maintained for at least seven days[6-8].

The fact is that the technological and scientific advances obtained in endodontics provide an infinity of resources that facilitate clinical management in the most diverse endodontic and periapical pathologies[9]. Devices such as: foraminal locators, magnifying glasses, NiTi files, reciprocating systems, ultrasonic irrigation devices and the detailing of the anatomy of the root canal system, allow the endodontist to treat the root canal quickly and safely in a single session[1,2]. However, it is noteworthy that the decision of which treatment protocol to adopt and which materials use is exclusively of the professional responsible for the case[8].

Despite the large increase in scientific evidence that proves the effectiveness of necropulpectomy in a single session, there are still many doubts about its use in general practice[7]. The biggest point of divergence in the use of this technique is in relation to pain after treatment, which for critics, it can be an indication of short- and long-term failure[10]. However, it is worth mentioning that the literature points to postoperative pain as a normal reaction in the process of repair and healing of apical and periapical tissue and that it should be well evaluated. Before becoming an indication of failure in endodontic treatment[11].

Another factor that leads professionals not to perform endodontic treatment in a single session on necrotic teeth is the fear of flare-up occurring after treatment[3]. Flare-up can be defined as a true emergency that occurs between sessions or after completion. Of treatment and is characterized by severe acute pain and swelling[12]. However, studies reveal that there is no statistically significant difference in the incidence of flare-ups between single-visit and multi-session endodontic treatments[13].

Therefore, the objective of this work is, through a literature review, to evaluate the success of endodontic treatment of necrotic teeth in a single session.

2. MATERIALS AND METHODS

This study reviewed the most relevant articles on the endodontic treatment of necrotic teeth in a single session, published from 2000 to 2020. The literature search was performed by searching PubMed and Google Scholar databases in May and June 2020. descriptors used for the research were: root channel treatment and single session and multiple sessions; success and endodontic treatment; postoperative pain and frare-up; single and multiple session root canal treatment; success in endodontic treatment; postoperative pain and flare-up.

3. DEVELOPMENT

Pulp necrosis consists of the mortification and decomposition of pulp tissue, caused by caries, periodontal diseases, trauma, or physicochemical agents, the first being the most common cause[2,14]. In cases of caries or pulp exposure, the infiltration of microorganisms occurs. Existing in the oral cavity that cause an inflammatory process that, if not treated early, evolves into an infectious condition that can lead to pulp gangrene[9-14]. If not controlled, pulp gangrene evolves into apical periodontitis, which is an inflammatory disorder in the periapical tissues. Which causes destruction and resorption of periapical bone tissue[6].

When necrotic, the root canal becomes an ideal environment for bacterial multiplication, as it contains many nutrients, a temperature around 37º and the absence of light and humidity[9]. The infectious process begins with anaerobic bacteria. facultative plants that tolerate the presence of oxygen, but over time the oxygen becomes scarce and there is a predominance of strict anaerobic bacteria that are intolerant of this[15]. Once installed, these bacteria take advantage of the dentinal tubules, isthmus, lateral canals, and apical deltas to diffuse through the apical region, exacerbating the infectious process and consequent induction of periapical lesion[16].

In most cases, pulp necrosis is clinically asymptomatic, but when associated with a periapical abscess, it can show intense painful symptoms and fistula[6]. According to Denardi *et al.* (2010)[14], the most practical way to diagnose pulp necrosis is by through pulp vitality tests, whose answer is negative. Radiographic examination, despite not being mandatory in the diagnosis of teeth with pulp necrosis without associated periapical lesion, is very useful in endodontic treatment, since through this it is possible to determine the root anatomy, define the working length and evaluate the quality. Of the root canal filling, as well as assessing the degree of periapical repair in the short and long term[5].

The endodontic treatment of necrotic teeth aims to control the infection through the complete removal of the necrotic pulp, neutralization of the septic content and three-dimensional filling of the root canal system[2]. In this sense, it is emphasized that the choice of a correct treatment protocol is one of the main factors for obtaining clinical and radiographic success[14]. However, what for some experienced professionals seems to be an easy task, for others less experienced this becomes a somewhat complicated task, since they bring them doubts and insecurity regarding the decision to choose to perform the treatment in a single session or in multiple sessions[17].

The indication of biopulpectomy in a single session is little contested in the literature, but when it comes to necropulpectomy, there are still many disagreements of opinions regarding its performance in a single session[1-18]. Even the literature showing clinical and radiographic follow-up studies in favor of

necropulpectomy in single session the discussion is still great, as histological studies show that there is no total tissue repair in these cases.[17] According to Rezende *et al*. (2000)[18], the main factors in discussions on this subject are: postoperative pain, increased infection, and the long-term success rate.

Regarding the risk of increased infection, this seems to be lower in single-session treatment, since in multiple sessions there is a risk of bacterial recontamination between sessions[1]. An in vitro study designed by Siqueira Jr *et al.* (2002)[19] demonstrated that instrumentation of the root canal combined with different irrigation methods using sodium hypochlorite at concentrations of 0.5 to 5% significantly reduced the number of positive cultures in the root canal. However, other studies demonstrate that only part of the bacteria existing in the root canal are eliminated during the chemical-mechanical preparation[7-15].

Sodium hypochlorite in its various concentrations is considered the gold standard irrigant in endodontics, as it has broad-spectrum antibacterial activity in addition to being a solvent for organic matter[19]. However, due to the anatomical complexity of the root canal system, there are regions inaccessible to chemical preparation mechanical. To optimize the action of the irrigating solution, passive ultrasonic irrigation devices have been used in the cleaning and disinfection of the root canal system, since they agitate the irrigant through ultrasonic vibrations causing it to spread through regions of difficult access[20].

During the chemical-mechanical preparation of the root canal, there may be extrusion of infected material and dentin scrapings through the apical foramen and cause flare-up after the end of the treatment[11]. Currently, endodontics has modern automated instrumentation equipment such as reciprocating and rotary systems[19]. Reciprocating and rotating instrumentation systems have great advantage and practicality in necropulpectomy in a single session, since, as they are made of nickel and titanium, they allow instrumentation of both straight and curved canals and the kinematics of their active tip expel toxic products in the coronary sense, in addition to providing time savings for the professional and the patient[10].

For instrumentation of necrotic root canals, the scientific literature recommends the crown-down instrumentation technique (crown-apex)[6,9]. This technique consists of the initial widening of the cervical/middle third and then the apical third, and both rotary and manual instruments or a combination of both can be used[22]. When the chemical-mechanical preparation is well performed, it is entirely possible to have a reduction in the periapical lesion, however, even though the root canal is free of microorganisms, it is not should be left empty, so intracanal medication or filling materials should be used to fill the voids and prevent bacterial recontamination[14].

In case of treatment in multiple sessions, an intracanal medication should be used between sessions to help disinfect the root canal[9-23]. In cases of dead pulp, a paste based on calcium hydroxide associated with another antimicrobial agent and an inert vehicle (glycerin), it must be manipulated and taken to the canal with the aid of a lentulo spiral coupled to a low rotation micromotor, filling all the empty space, being kept in it for a minimum period of five to seven days[7]. Studies demonstrate that the association of calcium hydroxide with camphorized paramonochlorophenol or chlorhexidine increases the spectrum of action of the medication, accelerates the bacterial destruction process and delays the root canal reinfection process[8,15].

With the objective of promoting the sealing and enclosing of the bacteria remaining in the root canal, gutta-percha cones associated with an obturator cement have been used in endodontics. One of the requirements for an endodontic cement to be considered ideal is to have antibacterial properties, so there are currently a multitude of endodontic cements on the market that promise to fulfill this purpose[24]. A study compared the antimicrobial efficacy of four types of endodontic cements against microorganisms. Commonly found in necrotic root canals and concluded that most cements showed antimicrobial activity against the microorganisms used[25].

There is no consensus in the literature on the time needed to assess the long-term success or failure of endodontic treatment of necrotic teeth and associated periapical lesions[2]. However, an indication of short-term success would be the absence of painful symptoms and clinical signs. Characteristics, such as fistulas, edema or tactile sensitivity[14]. On the other hand, the indication of long-term success would be the partial or total reduction of the periapical lesion in addition to the absence of painful symptoms[4].

4. DISCUSSION

The choice of treatment type for necrotic teeth can vary from professional to professional. The dental surgeon, within his limitations, has full autonomy to adopt the treatment protocol that he deems to be the best for solving the clinical case, if it does not cause harm to his patient[5-9]. However, in the adoption of a protocol of treatment, some factors must be considered, such as: manual dexterity of the operator, familiarity with the technique and instruments available, patient's time, absence, or presence of periapical lesion and purulent collection[1,2,7].

For Chagas *et al.* (2000)[22] endodontics is divided between those professionals, clinicians or specialists who practice necropulpectomy in a single session and those who do not practice it at all. A study carried out with part of clinical endodontists in Goiânia showed that more than half of the professionals interviewed did not complete the endodontic treatment of necrotic teeth with periapical lesion in a single session[17]. In these cases, some authors indicate completion of the treatment in two or more sessions with the use of an intracanal medication based on calcium hydroxide[7,26].

Kim & Kim (2015)[8] in their literature review,

evaluated the effectiveness of calcium hydroxide as intracanal medication between sessions and concluded that it showed limited action, since some bacterial species remained active in the root canal after its use. Another study showed no significant differences in long-term tissue repair between endodontic therapy in a single session and in multiple sessions with the use of intracanal medication[27]. Studies show that to potentiate the action of calcium hydroxide on some bacterial species resistant to it, this should be combined with camphorized paramonochlorophenol or chlorhexidine[8,15].

Regarding the occurrence of postoperative pain, studies reveal no statistically significant differences in single-visit or multiple-session endodontic treatment[11-16]. A randomized clinical trial performed by Wong *et al.* (2015)[10] compared the incidence of postoperative pain after endodontic treatment of 275 teeth in a single session and 263 in multiple sessions, these patients were evaluated from one to seven days through the application of a pain questionnaire and it was concluded that in both groups there were reports of pain after the first day of treatment and no or little pain on the seventh day. They also concluded that when pain intensity was evaluated, it was lower in the single session group, which was corroborated by Schwendicke & Gostemeyer (2017)[3].

The fear of flare-up after endodontic treatment is another factor that leads many professionals to choose to perform the treatment in more than one session[3]. However, a study by Laurindo *et al.* (2011)[12] evaluated 90 patients treated in a single session and 27 treated in multiple sessions, the patients were evaluated by means of a questionnaire regarding the presence or absence of painful symptoms at intervals of 24, 48 hours and one month after the conclusion of the treatment and the results obtained showed that there was no flare-up occurred in none of the two groups. What led the authors to conclude that the number of treatment sessions does not influence the occurrence of flare-ups.

A study revealed that the risk factors for the incidence of flare-ups as: pulp status of the tooth, pre-treatment pain, age and sex and that factor such as instrumentation technique, intracanal medication, irrigating substances and number of treatment sessions were not related to the incidence of these[21]. Another study pointed out that apical extrusion of debris, over instrumentation, overfilling and incomplete disinfection of the root canal system are directly related to the occurrence of flare-ups and postoperative pain[28]. To prevent, the literature recommends the use of some artifices, such as: instrumentation technique crown-apex, set the working length 1mm short of the radiographic apex, and use a device to stir the irrigating solution into the root canal[13].

The irrigating solution plays a very important role in the root canal sanitation process since it reaches regions inaccessible to instrumentation[19]. An in vivo study evaluated the degree of repair of apical periodontitis in teeth treated in a single session using different irrigation protocols. With sodium hypochlorite and concluded that in most cases there was long-term tissue repair[29]. Studies show that there are no significant differences in bacterial reduction using different concentrations of sodium hypochlorite, that is, its bactericidal effect and solvent of organic matter it is not related to its concentration, but to copious irrigation and constant changes of this substance inside the root canal[7].

One of the factors that can lead to endodontic treatment failure is the permanence of the smear layer in the root canal system at the time of filling, which leads to failures in the process of adhesion of the filling material to the root walls[2]. To minimize this risk, chelating solutions such as ethylenelenediaminetetraacetic acid (EDTA) are used in endodontics. A study compared the effectiveness of the association of sodium hypochlorite to EDTA in the final irrigation of root canals with or without ultrasonic agitation and concluded that the use of this substance provided a better removal of the smear layer and greater exposure of the dentinal tubules, and that the ultrasonic agitation did not provide better cleaning of the walls compared to conventional irrigation[30].

Studies reveal that the way professionals treat their patients is a consequence of what they learned in college[17,18]. A research work carried out by Chagas *et al.* (2000)[22] by sending letters to different North American universities, showed that most of them teach their students to treat necrotic teeth in a single session and that they do not believe that immediate filling is related to treatment failure. This was corroborated by Soares & Cesar (2001)[5] in their study when they treated 28 teeth with chronic periapical lesions in a single session and observed that 13 of them showed complete resolution of the periapical radiolucent areas after one year of treatment and all were asymptomatic.

Braitt *et al.* (2015)[4] reported a clinical case in which they treated six anterior teeth with extensive periapical lesions in a single session, using a rotary instrumentation system, 6% sodium hypochlorite, crown-apex instrumentation technique and filling with bioceramic cement. The treatment plan consisted of in-session necropulpectomy followed by surgical removal of the lesion 24 hours after the filling, however the patient did not attend the next session, only returning to the office two years later reporting no discomfort or symptoms. When performing the radiographic examination, a total repair of the lesion was observed in the region where the procedure was performed, thus confirming the success of the treatment.

5. CONCLUSION

The success of endodontic treatment of necrotic teeth is closely related to controlling the infectious process and respecting the different phases of treatment. When treating necrotic teeth, the professional must keep in mind that any failure in the disinfection process, instrumentation or obturation of the root canal system can lead to short or long-term

failure. An indication of failure in the short term would be the presence of intense painful symptoms and edema that did not stop after two days of treatment, and in the long term it would be the increase in the periapical lesion and the presence of characteristic clinical signs.

Therefore, when well performed, it is entirely possible to achieve successful endodontic treatment of necrotic teeth in a single session, even in cases with associated chronic periapical lesion. What will dictate the success or failure of the treatment will be the scientific clinical knowledge of the dentist, as well as his familiarity with the equipment and techniques available. Therefore, it is inferred that the number of treatment sessions does not interfere with the success or failure of endodontic treatment of necrotic teeth.

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