

**Comparative analysis between complete removal of cariated dentine, expectant treatment and partial selective removal in single session: literature review****Análise comparativa entre a remoção completa da dentina cariatada, tratamento especial e remoção selectiva parcial em sessão única: revisão da literatura**

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**ABSTRACT**

Introduction: Dental caries is a multifactorial disease that affects individuals in different age groups and evolves significantly rapidly. This disease has several therapeutic options, within dentistry. In the current context of Minimally Invasive Dentistry, the removal of carious dentin selectively has been effectively used to control caries disease. Minimizing the risk of pulp injuries in elements with deeper lesions, through the maintenance of dentinal tissues that can be remineralized. Thus, discussions about expectant treatment, removal of all carious tissue and selective removal of carious dentin in a single session, has gained prominence in the literature covering cariology. Objective: The objective of this work is to approach through a simple literature review, a comparative analysis of the three main methods of removal of dental caries. Methodology: A literature review was conducted, with search in the various databases (PubMed; Lilacs and Bireme) of scientific articles published in journals and book chapters, with specific descriptors, addressing caries disease and its therapies, already described. As inclusion criteria, articles published in the last 10 years were selected, written in English, Portuguese and Spanish. Also included was a classic article of cariology, which refers to selective removal in 1943.

And as exclusion criteria: articles published more than ten years ago and that are not of scientific impact. Conclusion: In the selected literature, it is possible to evidence that the three techniques for treating carious lesion are considered effective in their purposes, when well indicated.

**Keywords:** Dental Caries; Dentistry; Education in Dentistry; Secondary dentin; Dentin.

## RESUMO

**Introdução:** A cárie dentária é uma doença multifactorial que afecta indivíduos em diferentes grupos etários e evolui significativamente rapidamente. Esta doença tem várias opções terapêuticas, dentro da medicina dentária. No contexto actual da Odontologia Minimamente Invasiva, a remoção selectiva da dentina cariogénica tem sido utilizada de forma eficaz para controlar a doença da cárie. Minimizando a riqueza de lesões de polpa em elementos com lesões mais profundas, através da manutenção de tecidos dentinários que podem ser remineralizados. Assim, as discussões sobre tratamento expectante, remoção de todo o tecido cariogénico e remoção selectiva da dentina cariogénica numa única sessão, ganhou proeminência na literatura que abrange a cariologia. **Objectivo:** O objectivo deste trabalho é abordar através de uma simples revisão bibliográfica, uma análise comparativa dos três principais métodos de remoção da cárie dentária. **Metodologia:** Foi realizada uma revisão bibliográfica, com pesquisa nas várias bases de dados (PubMed; Lilacs e Bireme) de artigos científicos publicados em revistas e capítulos de livros, com descritores específicos, abordando a doença da cárie e as suas terapias, já descritas. Como critérios de inclusão, foram seleccionados artigos publicados nos últimos 10 anos, escritos em inglês, português e espanhol. Também foi incluído um artigo clássico de cariologia, que se refere à remoção selectiva em 1943. E como critérios de exclusão: artigos publicados há mais de dez anos e que não são de impacto científico. **Conclusão:** Na literatura seleccionada, é possível demonstrar que as três técnicas de tratamento da lesão cariológica são consideradas eficazes nos seus propósitos, quando bem indicadas.

**Palavras-chave:** Cárie dentária; Odontologia; Educação em Odontologia; Dentina secundária; Dentina.

## 1 INTRODUCTION

Several pathologies could affect the oral cavity, through dysbiosis, however, there is a highlight due its elevated prevalence to dental caries. This condition is considered a global health issue by the WHO. It is a multifactorial disease, limited not only by the dental structures, presenting painful symptoms, dysfunctions on speech and even in patient's life quality, due to aesthetical impacts (SILVA et al., 2015; VIEIRA et al., 2018).

The carious lesions usually are treated when in its state of activated cavitated lesion or non cavitated lesion. The first condition is treated by controlling the factors causing the disease, whereas in the cavitated lesions it is necessary to utilize inactivation procedures (VALENTIM et al., 2017).

At the conventional technique, in which is made a complete removal of the carious lesion, the criteria of hardness of the dental tissue. By doing so, the dentist surgeon removes all the softened tissue area, both at the surrounding and the bottom walls. (BURNETT Jr; CONCEIÇÃO, 2007). The auctors

consider that this procedure grants the absence of cariogenic microorganisms at the cavity. Yet, Besic (1943) e Lula et al. (2009), point that even after complete removal there are still around 25 to 50% of viable bacteria.

Valentim et al. (2017) consider, based on a similar analysis, that there is other therapeutic measures to carious lesions. At this new approach, the carious dentin is divided in two layers. The most infected, located externally and the other layer of affected dentine, with viable remineralization and therefore no longer removed in restorative therapies.

There are two modalities to selective removal of carious tissue. One known as expectant treatment, made in two sessions. At the first session, the infected dentine is completely removed, whereas the affected dentine by the pulpar wall is kept and completely removed in the adjacent walls to promote good sealing. Additional to the selective removal, the cavity is cleaned and temporarily sealed, from 45~60 days, extensible to 6 months. After this period, some radiographic and clinical test are made and the remaining tissue is removed, and only then the definitive restoration can be done (BURNETT Jr, CONCEIÇÃO, 2007; LIMA et al., 2013).

The other technique has gaining light in partial selective removal of cariated tissue, done in just one session. Authors affirm that there are a discomfort in wxposing the pacient to two different clinical sessions, emerging from that the technique of partial selective removal in a single moment. In this method there is a complete removal of the carious dentine in the surrounding walls, based on the hardness criteria, when in the pulper wall, the process is the same as in the expectant treatment, removing only the infected part (BJORNDAL et al., 2010; JARDIM et al., 2015).

The understanding, therefore, is that there are three distinct therapy forms to active carious lesions. It is due to the Dentist Surgeon rely on adequate evidence and clinical experience, electing the best conduct to each clinical case, individually (VALENTIM et al., 2017).

Before these aspects, it is necessary that studies based on the main therapeutic methods keep growing in the literature, scientifically adequate to the carious disease. For its current importance in the Odontology, especially at the minimally invasive stream and in the perspective of maintaining the dental element the most intact if possible. This way, the objective of this paper is to approach, with a simple literature revision, a comparative analysis of the three main methods to remove dental caries.

## **2 METHODOLOGY**

The research is exploratory, a literature revision, with searches in several databases (PubMed, Lilacs and Bireme) of scientific papers published in periodicals and book chapters, with specific

descriptors, approaching carious disease and its treatment, already described. As inclusion criteria, the articles from the last 10 years published in Portuguese, English and Spanish were selected. One classic paper of the Cariology study field was also included. It refers to selective partial removal in 1943. As excluding criteria: articles published more than ten years ago and without scientific impact. The descriptors are: “Dental Caries”, “Odontology”, “Education in Odontology”, “Secondary dentine”, “Dentine”.

### **3 LITERATURE REVISION**

#### **3.1 DENTAL CARIES**

The dental caries is a chronic disease very common in the childhood, and due to its high prevalence and the high-quality life impact, it is considered a public health issue (BRIZON et al., 2014; NUNES et al., 2017; LIMA et al., 2018; NÓBREGA et al., 2019). Boing et al. (2014) affirm that this oral disease, at the beginning of the XXI century, affected between 60% and 90% of children at school age, besides a significant proportion of adult people over the world.

Defining caries, some authors consider it as a multifactorial, infected, transmissible and diet dependent disease, that favors the demineralization process in the dental element structures. Uniting these factors, the concept results in a scheme, known as Keyes' Diagram. Observing that other items, especially time, would be determinant at the formation and progression of carious disease, another diagram was created (LIMA, 2007).

At other strand, still Lima (2007), affirms that the dental caries should not be considered infectious nor transmissible. The author considers that it should be called, simply, lesion of the dental structures provoked by a local chemical disbalance, through the demineralization – remineralization process.

Following that line, Losso et al. (2009) assure that carious lesions emerge bay the presence of dental biofilm, which is responsible for the demineralization process of the affected dental tissues. For this to occur, authors evidence that there is the necessity of three factors entangled: microorganisms, fermentable substrate, and a susceptible host. The interaction of these factors for a determined period favors the development of the carious disease.

The lesions start with an opaque stain, without cavitation, at the dental surface. In its evolution are observed the appearance of cavitation with dental structure loss, and if the loss is not treated, it could progressively evolve until all the coronary structure is affected and destroyed. That could lead to a greater infectious process in radicular and pulpar structures. (LOSSO et al., 2009).

The early diagnosis of carious lesions is important to achieve an effective treatment and to block the evolution of the disease to the cavitation or other dental structures (SANTANA et al., 2017). The therapy includes use of fluorides and, if necessary, tooth extraction. Observing, so, that the treatment of choose depends of the level of aggression from the caries to the dental structure. (BONACHELA et al., 2014; MARTINS et al., 2018).

### 3.2 COMPLETE REMOVAL OF CARIATED DENTIN

Some removal forms of carious tissue have been tauted in the literature. The complete removal of affected tissue through the caries intent to remove all the dentine affected by the carious process. (RICKETTS et al., 2013; SCHWENDICKE et al., 2013; INNES et al., 2016).

This technique was and still is widely spread in the traditional odontology. It is based on the concept of removing completely the carious tissue, with the intent of preventing the progression do carious disease and provide a well mineralized base to the dental tissue to finally promote the rehabilitation of the dental element with the restoration. (THOPSON et al., 2008).

Nevertheless, Maltz and Jardim (2014) showed in their work that the complete dentine removal does not leave the cavity free of microorganisms. It was also proved, comparing to the partial removal of carious tissue, that the sealing carious dentine results in lesser levels of infection than the complete removal of this tissue.

### 3.3 EXPECTANT TREATMENT

The therapy of carious lesions using the expectant treatment results in a therapeutical measure to avoid endodontic procedures. It leads to decreased tooth resistance, dehydration and dryness, aside from the possible color change in the dental element. (LOURO et al., 2009; SILVA et al., 2018).

The technique consists in two interventions, the first one being the excavation intending to superficially remove infected carious dentin of the central part of the lesion and completely remove the peripheral portion. Then, there is the temporary seal accompanied for 45 days, extendable to 2 years. (ARAÚJO et al., 2010).

The pathological process in the remaining tissue, at this new environment, allows decrease in the presence of microorganisms and remineralization, verified by the raise in phosphorus' levels and by the changes in color and consistence of the dentine. (ARAÚJO et al., 2010; MONARI et al., 2011). Expectant treatment presents as main advantage when gives the dentist a tighter control by which it is possible to avoid pulpar exposition in deep carious lesions, promoting other more invasive therapies.

However, this technique has the downside of demand more clinical time, for the reopening of the cavity, which could also promote raised risks of pulpar exposition.

#### Partial removal of the carious tissue in single session

The single session partial removal of carious tissue consists in the maintenance of the demineralized dentine at the pulpar walls and the definitive sealing with bioadequate material. (ARAÚJO et al., 2017). The cavity seal made with adequate material inhibits microorganisms' growth to the remaining affected dentine at the pulpar and axial walls. (JARDIM et al., 2015).

Some authors state that the partial removal of carious tissue in single session reduces and/or solves the disadvantages seen on the expectant treatment, specially related to the second clinical session. The method is capable of paralyze the progression of the caries, favor the mineralization of the tissue by tertiary dentine deposit and stabilize or minimize the lesion area. (MALTZ et al., 2013).

Jardim et al. (2015) in a six-year study, evaluated 127 permanent dental elements. From these, 64 received the selective removal of caries, with 18 failures and 46 successes. At the other group, with 63 dental elements receiving the expectant treatment, there were 29 failures and 34 successes. It is evidenced, therefore, a 60% success rate to the Partial Removal in single session group. With this data, the technique was suggested as definitive treatment.

The success rates of this technique are described, yet, by other authors. Franzon et al. (2015) relate that in decayed dental elements submitted to Partial Removal in single session there were less occurrence of pulpar exposition and consequently less invasive treatment required. Santamaria and Innes (2014) proved, by the clinical and radiological success rates, that Partial Removal in Single Session is a trustable minimally invasive procedure, with less pulpar exposition and minimal clinical time.

Based on the evidences of the literature and before a new reality brought by the Sars-CoV-2 (COVID-19) pandemic, the technique should be recommended, considering its possibility to spare rotary instruments that can generate aerosols in dental clinics. It is known that handpieces, especially with high speed, could promote the airflow of oral viruses and bacteria. (SALGADO et al., 2020; FRANCO et al., 2020; PENONI, 2020).

## 4 CONCLUSION

Cariou lesion is a widespread pathology, being considered as a great public health issue. Before a disease with several possible therapies, the professional interventions should be evaluated according



to each case. The literature, in this sense, recommend some possible techniques, as the ones hereby discussed.

At pandemic times, the most utilized therapy and with satisfactory results is the partial removal method. Especially by having the possibility with exclusively manual instruments, reducing the microorganisms' airflow at the environment of the dental clinic.

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