



Pesquisa Brasileira em Odontopediatria e
Clínica Integrada

ISSN: 1519-0501

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Universidade Estadual da Paraíba
Brasil

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Pesquisa Brasileira em Odontopediatria e Clínica Integrada, vol. 15, núm. 1, 2015
Universidade Estadual da Paraíba
Paraíba, Brasil

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Original Article

Conservative Treatment of Deep Dentin Lesions in Primary Molars: Case-Series

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Academic Editors: Alessandro Leite Cavalcanti and Wilton Wilney Nascimento Padilha

Received: 29 January 2015 / Accepted: 01 July 2015 / Published: 20 October 2015

Abstract

Objective: To carry out a descriptive analysis of a case-series in which the indirect pulp capping (IPC) has been performed for treating primary molars with extensive caries lesions in dentin, in the Private of Specialization in Pediatric Dentistry. **Material and Methods:** A single calibrated examiner evaluated the medical records of 155 patients aged 2 to 13 years attended at the Foundation for Scientific and Technological Development of Dentistry (FUNDECTO) partnership the University of São Paulo (USP) in 2011-2013 in search of extensive caries lesions treated during this period. Were found only 20 deep caries lesions and with satisfactory clinical and radiographic documentation. Then, the materials and techniques used were collected, as well as instant success described after treatment and observation for no progression of the disease (pain, abscess or fistula). **Results:** The 20 lesions evaluated reached at least 2/3 of the dentin thickness and were active. In 70% of cases, the restorations were carried out with high viscosity or encapsulated glass ionomer cement, and in 30% of case with light-cured resin. In only one case was used calcium hydroxide cement as liner material before inserting resin. In the teeth treated, only three cases were considered failures. **Conclusion:** Regardless of the restorative material used and the technique employed, good immediate success rates of the conservative treatment in deep dentin lesions were found, which consequently reduces the risk of exposure and pulp intervention.

Keywords: Dental Pulp Capping; Dental Caries; Tooth, Deciduous.

Introduction

The indirect pulp capping (TPI) or treatment is indicated for extensive dentin lesions where, following the principles of minimal intervention, recommends the partial removal of carious tissue, followed by use of restorative materials that promote an effective sealing of the margins of the cavity preparation, in order to prevent further injury and preserve the pulpal vitality [1-3].

It may be considered deep caries lesion a widely cavitated lesion compromising over two-thirds of the dentin thickness [4] or about three-quarters of the clinical crown [5]. In these lesions, it is indicated only careful removal of the most superficial dentin (also called infected). The recommendation of not remove the deepest dentin (named affected) is based on the prerogative of this tissue has remineralization ability [6]. On the other hand, it is compulsory the complete removal of the carious tissue (infected and affected dentin) on the margins of the "cavity preparation", which favors adhesion of the restorations and consequent discontinuity of communication between cariogenic bacteria and their source of nutrients: the biofilm [6].

The IPC technique can be performed in one or two sessions. Given the need for reopening, the IPC performed in two appointments is also known as expectant treatment or stepwise excavation [7]. However, current scientific evidence shows that the reopening of the tooth, followed by a new step of removal of demineralized dentin, is unnecessary, due to the proven the remineralization ability of the affected dentin [8-10].

Following the precepts of partial removal of carious tissue, there are professionals who choose to use a lining material (calcium hydroxide or glass ionomer cement or adhesive) in order to "protect" the pulp-dentin complex and encourage the remineralization step [11]. On the other hand, there is already evidence proving that the remineralization can occur regardless of the use and type of lining material used [11,12]. Thus, it is believed that the most important step is related to the presence of a satisfactory restoration, with complete marginal sealing surrounding the cavitation and consequent blockage of the substrate leakage, in addition to the quantitative decrease of the number of viable bacteria [13] and control of caries disease progression [3,14].

Monitoring the IPC seems not involve the finding of radiographic changes, keeping asymptomatic the most of patients [13,15]. This fact is due to the maintenance of the vitality and potential of pulp defense against the advance of the caries lesion [4,12]. Thus, the failure cases linked to the IPC are mandatorily bound to the difficulties inherent in the diagnostic process of pulp condition. In primary teeth, favourable results obtained by partial removal of carious tissue have substantiated the use of the IPC as a definitive treatment with favorable prognosis [1,16].

Although in dental literature there are some studies describing and analyzing the success and advantages of the IPC, it is still found resistance from some professionals regarding its use [12], besides no unanimity as to the technique and restorative material to be used.

Thus, the aim of this case-series study was to summarize materials, techniques used and the success immediate index (rate) of indirect pulp treatments applied to extensive caries lesions in

primary teeth treated in the Private of Specialization in Pediatric Dentistry of FFO between 2011 and 2013.

Material and Methods

This study was approved by the Research Ethics Committee in the Dentistry School of the University of São Paulo (document # 258,691). Retrospectively, were evaluated 155 clinical records of children of both sexes (65% male and 35% female), aged 2 to 13 years, treated at the Private of Pediatric Dentistry of FUNDECTO, in the years 2011, 2012 and 2013.

The criteria for inclusion of clinical records were: clinical or radiographic detection of deep lesions in primary molars (involving at least two thirds of the dentin thickness), but without note of clinical or radiographic signs indicative of pulpal necrosis (mobility, abscess or fistula or periapical bone rarefaction).

Clinical records with note of accomplishment of other treatments (dental extraction or pulpectomy), without note or detailed description of the IPC technique, no record of the use or non-use of a "liner" material and restorative material used were excluded.

The data collection was carried out by a single examiner (JB) trained to assess the clinical records and the radiographic findings; training conducted in consensus and moments of discussion of cases with an experienced researcher (JCPI), who is reference in the field of minimal intervention.

In the assessment of patient records, the following data were collected: the date of completion of the procedure, the patient's age, the primary tooth treated with the IPC technique, the report or not of painful symptoms pre- and post-operative, the type of isolation adopted (relative or absolute), the depth of the lesion (measured according to the dentin thickness divided into half or thirds) and the status of caries activity, in addition to the characterization of the lesion on the number of lost tooth walls, the material used for pulp protection (if used), the material used for restoration and the possible immediate record of clinical failure of the procedure reported by the presence of fistula, abscess, or spontaneous pain stated by patients immediately after the intervention. As reference conduct on the collection place, through any of these signs, the patients were advised to immediately seek the professional responsible for their care for scheduling a new appointment on up to three days, from where raised the description of failure related to the IPC in the patient's records. The presence of radiolucent image suggestive of pathological root resorptions or periapical/interradicular lesion were evaluated radiographically as a criterion for exclusion; on the collection success rate, given the need for greater follow-up period for manifestation of detectable changes through the x-rays, only clinical data of pain, abscess or fistula were accounted for.

Results

From the initial sample consisting of 155 clinical records, 77 clinical records were included by presenting at least one tooth with deep caries lesions in primary molars with no signs of bone rarefaction indicative of pulp necrosis. However, among these, 17 records were excluded due to

incomplete data noted. pulpectomy-treated teeth (n = 19) or tooth extraction (n = 21) were also excluded, justifying the adoption of radical therapies by the misbehavior of the patient, great crown destruction hindered the restorative procedure or detection of high risk and caries activity that usually do not favor the adoption of non-invasive conduct. In the end, 20 primary molars have been treated with IPC and assessed (Figure 1).

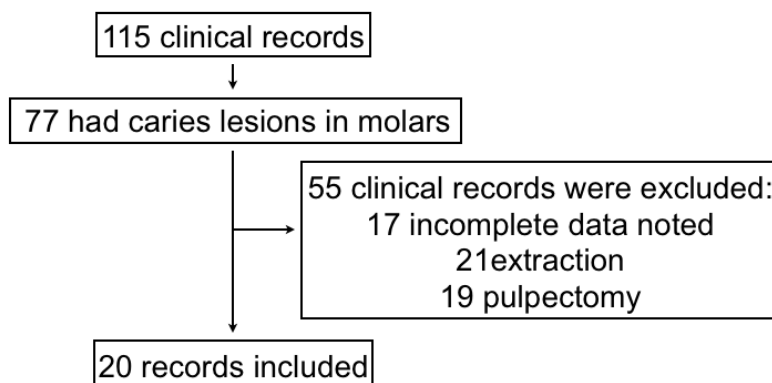
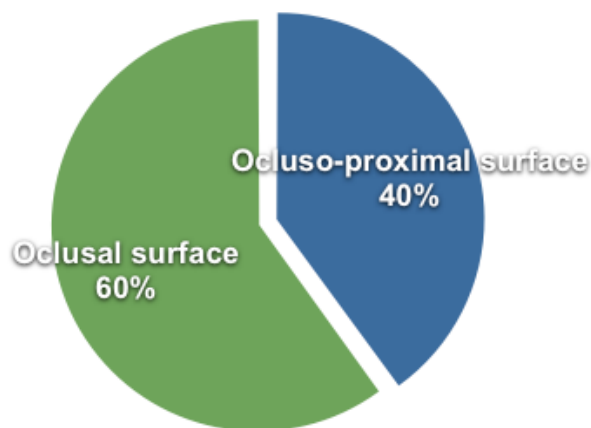


Figure 1. Research Flowchart.

The 20 lesions evaluated had reached at least two-thirds of the dentin thickness and were active. Among these, 12 (60%) involved only the occlusal surface and 8 (40%) were ocluso-proximal (Graph 1); 7 lesions had affected the upper primary molars, being 4 in the first molars, and 13 in the lower molars, being 7 in first molars (Table 1).

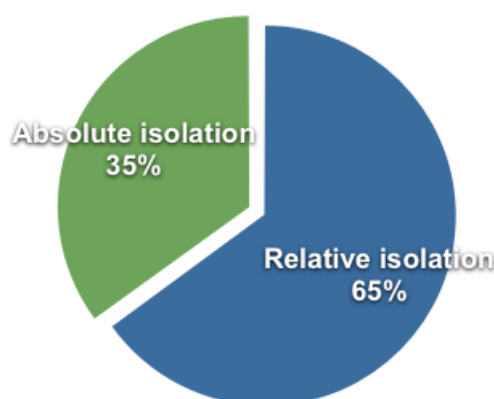


Graph 1. Caries lesions evaluated for surface affected.

Table 1. Caries lesions divided into arch and between first and second molars.

Caries lesions (n=20)	35% upper primary molars (n=7)	57.14% first molars (n=4)
		42.85% second molars (n=3)
	65% lower primary molars (n=13)	53.84% first molars (n=7)
		46.15% second molars (n=6)

With respect to the technique and materials used, all cases were treated in a single appointment; 35% (n=7) of teeth were treated with absolute isolation and 65% (n=13) with relative isolation (Graph 2).



Graph 2. Caries lesions evaluated for the isolation used during the treatment.

In 70% of cases, the restorations were built with high viscosity glass ionomer cement (Ketac molar, 3M ESPE; Maxxion R, FGM) or encapsulated (Riva Light Cure, SDI), and in 30% with light-cured resin (Filtek Z250, 3M ESPE; Opallis Pediatric Dentistry, FGM). In only one case the calcium hydroxide cement was used as lining material before applying composite resin.

Out of 20 teeth treated with IPC technique, three teeth were considered as failure by report of spontaneous pain in the post-operative period, one tooth showed fistula and two teeth had diagnosed with dental alveolar abscess.

Discussion

Currently, the concepts of minimal intervention has become a benchmark in dentistry, where the treatment of deep caries lesion is based on "minimally invasive" techniques by removing only the infected dentin and preventing the tooth against the need for a radical treatment [17].

There is great concern in treating deep caries lesions by great efforts involved in an attempt to keep the pulp vitality. To this end, the complete removal of carious tissue can result in pulp exposure and consequent dissemination of bacteria into the root canal system [8].

So, the clinical and radiographic results, associated with the evidence in the literature provides strong indicative that allow to define the indirect pulp capping as a conservative technique easy to perform clinically and can be performed in a single session. Following this statement, all reported IPC cases were carried out in a single service with finding a good success rate (about 70%). A hypothesis for the failure of the IPC may be the difficulty in diagnosis of pulpal health in which no examination is as effective for its proof.

The indirect pulp capping is performed with partial removal of carious tissue and then the tooth is restored. At the beginning, the treatment was performed with use of temporary restoration in order to wait for the formation of tertiary dentin and, subsequently, that restoration was replaced

by another restoration, now definitively [7]. Currently, the scientific evidence shows that after partial removal of carious tissue, the IPC can be performed in single session, with immediate and definitive placement of a restorative material [18]. In the partial removal of carious tissue all the fully softened, necrotic tissue is removed preserving a thin layer of carious tissue of leathery consistency in the bottom of the cavity walls; the decayed tissue on the walls surrounding the cavity preparation must be fully removed with the aid of drills and, preferably, sharp dentin curettes [13].

Thus, the expectant treatment, though it represents a proven therapeutic in the literature [1], is losing power in the scenario of evolution of minimally invasive dentistry, where the IPC stands out, questioning the realistic need for reopening of the cavity for total removal of the demineralized tissue, secondly [19].

A study was conducted in order to evaluate the activity and progression of caries lesion and the viability of bacteria present after partial removal of carious dentin and marginal sealing of restoration for a period of 6 to 7 months. Such results showed there is changes in the clinical picture observed (in color and consistency of remaining dentin) suggesting the lack of progression of the lesion, increase in the difference of radiographic density suggesting mineral gain, in addition to significant reduction in the count of microorganisms, indicating reduced or absent metabolic activity [8]. Thus, the success of the IPC seems not to depend on specifically the dexterity and experience of the operators [14], even though no consensus on the amount of the decayed tissue to be removed [20].

In this case series, despite the treatments have been carried out by different professionals and despite no longitudinal follow-up of patients, we believe in high success rates linked to the IPC, since the amount of infected dentin removed doesn't seem to interfere with successful treatment. Still in this context, although there is little evidence related to professional orientation about the ideal limit of removal of carious tissue, the authors conducted a systematic review in which suggest that minimally invasive techniques are the procedures of choice in the treatment of caries lesions in primary cavitated dentition [21].

Another question related to extensive carious lesions treatment involves the need for using or not a lining material on the bottom of the cavity. Some professionals choose to apply over the carious dentin a bacteriostatic or bactericidal material layer, being more used to this purpose the calcium hydroxide, supposedly able to induce remineralization and protect the pulp [22]. A gutta percha, wax or primer base can also be found. However, there are no sufficient references which prove how enduring or advantageous their use can be [2,3,11]. It was found only one case in which the calcium hydroxide has been used for protection of the pulp-dentin complex, but longitudinal studies investigating the clinical, radiological or long-term microbiological outcomes should be developed.

The choice of one type of restorative material should also be based on its clinical effectiveness proven by judicious clinical trials. With this purpose, we have found many in vitro studies and scarcity of high quality clinical trials that may guide the clinical decisions, one of the

pillars of the evidence-based dentistry [23]. Such doubts corroborate the current restorative options linked to IPC whose scenario split choices between using resin and ionomer materials.

In another study, the authors reported that restorations made of resin-modified glass ionomer cement, when compared to conventional glass ionomer restorations, showed similar effects, although the former are preferred for composite restorations (for instance, occlusal-proximal) in the primary dentition, whereas the high viscosity ionomers are preferred for cervical restorations [24].

Still with reference to restorative treatment in deciduous teeth, the glass ionomer cement showed to be an option as viable as the use of composite resins or amalgam [25,26]. For occlusal cavities, the glass ionomer cement is also an excellent choice, with longevity of up to six years, which is similar to the use of amalgam [27].

The use of absolute isolation presents advantages related to patient safety, improved visibility of the operating field, humidity control, infection control, better control of the patient, legal protection and a likely superiority in longevity of restorations. On the other hand, it presents disadvantages such as a possible intolerance of the patient, the higher expense of time and the reporting of large gum discomfort [28]. In the present work, albeit in descriptive way, with treatments performed in graduate teaching environment, we do not find professional preference for the use of absolute isolation, having been the most of IPC performed under relative isolation. In the long-term, by the study design, we could not draw a positive relationship between the longevity of the restoration and the use or non-use of the absolute isolation of the operating field.

Conclusion

Regardless of the restorative material used and the technique employed (with absolute isolation or not and with several restorative materials), the IPC presents high success rate, showing to be a viable alternative for maintenance of pulp vitality in cases of extensive cavitated carious lesions involving primary teeth.

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