

CASE REPORT

Chemo-Mechanical Caries Removal with Papacarie™: Case Series with 84 Reports and 12 Months of Follow-up

¹Sandra Kalil Bussadori, ²Camila Haddad Leal de Godoy, ³Thays Almeida Alfaya, ⁴Kristianne Porta Santos Fernandes ⁵Raquel Agnelli Mesquita-Ferrari, ⁶Lara Jansiski Motta

ABSTRACT

Aim: The aim of the present study was to determine the success rate after 12 months of follow-up in a series of cases in which chemo-mechanical caries removal (CMCR) was performed with Papacarie™, followed by restoration with glass ionomer cement.

Background: The development of conservative techniques for carious tissue removal and improvements in dental restoration materials have allowed better preservation of dental structures in the treatment of decayed teeth. Chemo-mechanical caries removal (CMCR) is a conservative atraumatic treatment option. Papacarie™ is a papain-based material developed to act only on the carious dentin, allowing its easy removal with a blunt curette.

Case report: The study involved a total of 84 deciduous posterior teeth with occlusal dentinal caries. Only teeth without risk of pulp exposure were studied. After a period of 12 months, the restorations were evaluated based on criteria employed in previous studies. The radiographic evaluation revealed resorption and calcification of the affected teeth. The data were submitted to descriptive statistical analysis with the aid of the XLSTAT program. The success rate was 88.1% and 98.8% based on the clinical and radiographic evaluations, respectively. The difference between the success and failure rates was statistically significant ($p < 0.0001$).

Conclusion: Papacarie™ is an effective product for CMCR on occlusal dentinal tissue in deciduous teeth, demonstrating a high clinical and radiographic success rate after 12 months of follow-up.

Keywords: Dental caries, Papain, Dental atraumatic restorative treatment.

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^{1,4,5,6}Professor, ^{2,3}Student

^{1,2,4,5}Department of Rehabilitation Sciences Postgraduation Program, Universidade Nove de Julho, Brazil

³Department of Dental Clinic of Postgraduation Program Universidade Federal Fluminense, Brazil

⁶Department of Health Systems Management, Postgraduate Program, Universidade Nove de Julho, Brazil

Corresponding Author: Sandra Kalil Bussadori, Professor Department of Rehabilitation Sciences Postgraduation Program, Universidade Nove de Julho, Brazil, Phone: 551133859222, e-mail: sandra.skb@gmail.com

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INTRODUCTION

The philosophy of minimally invasive treatment has led to changes in the approach to dental caries by allowing the maximum preservation of sound dental tissue capable of remineralization.¹⁻³ This form of treatment is administered based on the patient's risk of caries, proximity of the lesion to the pulp, pulp vitality, extent of the remaining supra-gingival tooth structure and clinical factors.⁴ Chemo-mechanical caries removal (CMCR) is in line with this philosophy and consists of the application of a proteolytic substance on carious dentin that softens the infected tissue, allowing its removal with a blunt curette.⁵ This technique is painless and avoids the use of rotary instruments and local anesthesia.^{2,6,7}

Papacarie™ is a gel used for CMCR that unites the cleaning and healing properties of papain with the disinfectant characteristics of chloramine.⁸ The formula was introduced in 2003 in Brazil and satisfactory results have been reported in a number of clinical trials.^{6,7,9-11}

The aim of the present study was to determine the success rate after 12 months of follow-up in a series of 84 cases in which CMCR was performed with Papacarie™, followed by restoration with glass ionomer cement.

CASE DESCRIPTION

The sample consisted of 84 deciduous posterior teeth in the upper or lower arch with occlusal dentinal caries categorized as 1.3 based on the Mount and Hume¹² classification (Fig. 1). Patient age ranged from 3 years to 5 years. Only teeth without risk of pulp exposure were followed up. This study received approval from the local Human Research Ethics Committee (CEP-UNIMES nº 004/2005). All parents/guardians received information regarding the objectives and procedures and signed a statement of informed consent, in compliance with Resolution 196/96 of the National Board of Health.

The procedures obeyed the following order: Pretreatment examination; signing of statement of informed consent; caries removal with Papacarie™ gel; cavity inspection; and restoration with high-strength glass-ionomer cement. All treatments were performed by the main investigator.

The cavity inspection for successful caries removal was performed by an independent examiner.

Cariou dentin removal followed the protocol for the use of Papacarie™ gel, as follows: Radiographic assessment; general field isolation of the operative site with a rubber dam (since the patient did not receive local anesthesia); dental prophylaxis with pumice and water; application of Papacarie™ gel to carious tissue for 40 seconds (Fig. 2); removal of infected dentin by scraping with blunt hand excavators; reapplication of gel and scraping of infected tissue until no signs of softened tissue remained or dentin shavings came out. After achieving the complete removal of the infected tissue and a glossy dentin surface (Fig. 3), the cavity was cleaned with 2% chlorhexidine digluconate and subsequent restorative procedures were performed using Ketac™Molar Easymix (3M/ESPE) (Fig. 4). The manipulation and mixing of the glass ionomer cement were carried out following the manufacturer's instructions.

Twelve months after treatment, clinical and radiographic exams were performed of the restorations on the 84 deciduous molars treated. The clinical evaluation was based on the criteria used in the study by Phantumvanit et al. (1996),¹³ considering both the restoration and tooth (Table 1). Codes 0, 1 and 7 denoted treatment success, whereas codes 2, 3, 4 and 8 denoted failure. Vertical and horizontal percussion tests were conducted. Color alterations and fistulas were investigated. Vitality tests, which are not reliable in small children, were not performed so as to avoid pain, as experienced in previous studies.^{14,15}

In the clinical evaluation, 28 restorations (33.3%) were classified as code 0; 19 (22.6%) were classified as code 1; four (4.8%) were classified as code 2; three (3.6%) were classified as code 3; one (1.2%) was classified as code 4; none was classified as codes 5 or 6; 27 (32.1%) were classified as code 7; and two (2.4%) were classified as code 8 (Table 2). The radiographic evaluation revealed resorption

and calcification of the affected teeth. Only case exhibited pulp involvement associated with a radiolucent image on the furca and accessory root canal areas indicating osseous defects. The other 83 teeth had normal radiographic aspects (Table 3).

In the clinical evaluation, 74 restorations (88.1%; 95% confidence interval: 84 to 99%) exhibited satisfactory conditions and were classified as successful and 10 (11.9%) were considered unsatisfactory. The difference between the success and failure rates was statistically significant ($p < 0.0001$).

DISCUSSION

The results of the present case series demonstrate a statistically significant success rate with the use of Papacarie™ gel for CMCR on occlusal dentinal tissue in deciduous teeth.

The discomfort caused by the use of high-speed burs, such as noise, overheating, possible harmful effect on the pulp tissue and patient anxiety, has motivated the use of CMCR.^{2,6,7} The majority of the studies on CMCR have compared Carisolv™ to the traditional method using a handpiece and round bur. Papacarie™ is a new product for CMCR and recent publications report that the use of this papain-based gel allows as shorter operating time,^{1,8,16-18} lower cost^{16,19} and a reduction in complaints of pain.¹⁶

Table 1: Phantumvanit's¹³ clinical evaluation of restoration and tooth

Codes	Description
0	Present, in good condition
1	Present, slight marginal defect, no repair needed
2	Present, marginal defects 0.5-1.0 mm, repair needed
3	Present, marginal defects > 1.0 mm, repair needed
4	Not present, restoration partially or completely missing
5	Not present, restoration replaced by other restoration
6	Tooth missing, exfoliated or extracted
7	Present, slight wear, no repair needed
8	Present, wear > 0.5 mm, repair needed



Fig. 1: Deciduous molar with carious lesion



Fig. 2: Application of Papacarie gel



Fig. 3: Following removal of infected dentin with blunt instrument



Fig. 4: Restoration with Ketac Molar EasyMix (3M ESPE)

Table 2: Status of restorations after 12 months

Code	0	1	2	3	4	5	6	7	8	Total
Number of restorations (n)	28	19	4	3	1	—	—	27	2	84
%	(33.3%)	(22.6%)	(4.8%)	(3.6%)	(1.2%)			(32.1%)	(2.4%)	100%

Table 3: Radiographic evaluation after 12 months

	Radiographic evaluation—pulp involvement		
	Present	Absent	Total
Number of restorations (n)	1	83	84
%	1.2%	98.8%	100%

The present study describes a case series involving the use of Papacarie™ with a 12-month clinical follow-up period. Kirziouglu et al (2007)¹⁴ carried out a study with another product designed for CMCR (Carisolv). The absence of similar studies demonstrates the originality of the present study and the importance of long-term follow-up to draw conclusions regarding the effectiveness of treatment.

A previous clinical trial analyzed young permanent molars treated with Papacarie™ followed by restoration with glass ionomer cement. Thirteen of the 14 teeth evaluated demonstrated treatment success at the 24-month follow-up, with the presence of an intact lamina dura and a radiolucent image with radiopaque points on the affected dentin, indicating re-mineralization, as well as the absence of pulp involvement and progression of the lesion.⁶ The present findings are in agreement with those reported in the study cited, as the success rate was far greater than the failure rate.

CONCLUSION

In conclusion, the satisfactory clinical and radiographic findings at the 12-month follow-up of restorations carried out with glass ionomer cement after the removal of carious tissue with Papacarie™ demonstrate that this product is effective for CMCR on occlusal dentinal tissue in deciduous teeth.

CLINICAL SIGNIFICANCE

Papacarie™ gel is a product designed for CMCR. This gel unites the cleaning and healing (antibacterial and anti-inflammatory) properties of papain with the disinfecting properties of chloramine.

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