Evaluation of the Chemo-Mechanical Method (Carisolv) for Removal of Carious Dentine among Primary School Children


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Abstract

Objective: To clinically evaluate the effectiveness of Carisolv on dentinal caries and to assess pain perception among primary school children.

Material and Methods: This study has been conducted during 2016. A total of 50 primary school children (24 females and 26 males) aged 6 to 11 years who attended the outpatient clinics of Pedodontics at King Khalid College of Dentistry, Abha, Saudi Arabia. Removal of carious dentine was achieved by the chemo-mechanical method (Carisolv). Effectiveness of caries removal was numerically scored from 0 (removed completely, to 5 (caries remained in the bases, walls and the margins of the cavity). Pain faces scale were used for the assessment of perceived pain by children. It ranged from a smiling face (0, no pain) to a crying face (3, severe pain).

Results: Caries could be completely removed among 74% of the children, and 60% of children had no pain, while 32% had mild pain.

Conclusions: Carisolv is an effective clinical alternative of treatment for the removal of occlusal dentinal caries. It is almost painless, non-invasive technique of caries removal. It is of potential interest for use in Clinical Pediatric Dentistry.

Key Words: Dental caries – Chemo-mechanical method – Carisolv – Pedodontics.

Introduction

DENTAL caries is one of the most prevalent chronic diseases. It causes localized dissolution and destruction of the calcified tooth tissue. It may also result in infection of the dental pulp [1].

The key objective of treating carious lesions is to remove the infected layer, leaving the unaffected dentin intact. It is significant to differentiate these layers to prevent the painful and unnecessary removal of sound tooth structure [2].

In children, restorative dental treatment by removal of caries with conventional drill is traumatic. It causes fear and anxiety both to children and their parents. The irritating noise of rotary instruments and anesthesia are the key elements triggering fear and anxiety. In most cases, these factors usually lead to delay or avoidance of the uptake of dental treatment by children, leading to emergency situations later on. Therefore, the treatment frequently becomes more complicated with the possibility of obligatory use of anesthetics [3].

In restorative dentistry, it is ideal to ensure maximum life for the natural tooth by preserving the sound tissue from further damage through using minimally invasive techniques [4]. Among these techniques, chemomechanical caries removal is generally considered as an effective alternative to the traditional rotary drilling method [5].

The main objective of chemo-mechanical caries removal is to eliminate the outermost carious portion (infected layer), leaving behind the affected demineralized dentin that can be remineralized and repaired. The concept of chemo-mechanical removal of caries was re-introduced using a solution of sodium hypochlorite combined with three amino acids; L-glutamic acid, L-leucine and L-lysine, and is marketed as Carisolv [6].

Carisolv involves the chemical softening of carious dentine within a short period after its application, followed by its removal by gentle excavation. Only limited studies have been attempted to evaluate the efficacy of Carisolv in the re-
removal of carious dentine in the primary teeth and the perception of this technique by children [6].

Therefore, this study aimed to clinically evaluate the effectiveness of Carisolv on dentinal caries and to assess pain perception among primary school children.

**Material and Methods**

This study has been conducted during January 2016. A total of 50 primary school children (24 females and 26 males) aged 6 to 11 years who attended the outpatient clinics of Pedodontics at King Khalid College of Dentistry, Abha, Saudi Arabia. Those who had dentinal caries that were accessible for hand instrumentation on intraoral examination were selected for the study. Children with teeth with any pulpal or periapical involvement, undergoing orthodontic treatment or medically and physically compromised were excluded from the study. Parental consent and ethical committee clearance were obtained prior to the study.

Carisolv gel is a 2-component mixture. Equal parts of the two are mixed to form the active gel substance. The formulation of Carisolv is isotonic and consists of the following components: Syringe one contained sodium hypochlorite (0.5%) and syringe two consisted of three amino acids (glutamic acid, leucine, lysine), gel substance (carboxymethylcellulose), which enhances the viscosity, sodium chloride/sodium hydroxide that provides a pH of 11 and saline solution that act as a vehicle [6].

The involved tooth was isolated and the two components of Carisolv gel were mixed thoroughly in a Dapen dish according to the instructions included with the package. A Carisolv instrument was used to pick up the gel and apply it to the carious dentine. Waiting time was at least 30 seconds for the chemical process to soften the caries. The superficial softened carious dentine was scrapped off with the hand instruments. Flushing or drying the cavity was avoided. Scraping of the lesion was continued until the gel became cloudy and the surface was felt hard, using instrument. When the cavity was free from the caries, the gel was removed and was wiped with a moistened cotton pellet or rinsed with lukewarm water. The cavity was then inspected and checked with a sharp probe. New gel was applied and scraping was continued until the cavity was not caries free. When necessary the periphery of the cavity was adjusted using hand instruments or the airotor. The tooth was restored with a suitable filling material. Clinical picture of the case treated with Carisolv [6].

Effectiveness of caries removal was assessed according to Ericson et al., [7] and was numerically scored as 0 (removed completely), 1 (caries remained in the base of the cavity), 2 (caries remained in the base and/or one wall), 3 (caries remained in the base and/or 2 walls), 4 (caries remained in the base and/or more than 2 walls), or 5 (caries remained in the bases, walls and the margins of the cavity). Pain faces scale were used for the assessment of perceived pain by children. It ranged from a smiling face (0, no pain) to a crying face (3, severe pain).

**Results**

Table (1) shows that 74% of caries among children could be removed completely, while caries remained in the base of the cavity among 18% of children and in the base and/or one wall in 6% and caries remained in the base and/or 2 walls only one child (2%).

Table (2) shows that 60% of children had no pain, 32% had mild pain, while 8% had moderate pain.

**Discussion**

Results of the present study showed that 74% of children had complete caries removal, while incomplete caries removal was found in 13 children (26%). This clearly indicates that the chemo-mechanical method of Carisolv, is an effective method for caries removal under clinical criteria.

This finding is in accordance with that of Fluckiger et al., [8] who reported that Carisolv as a highly effective method for caries removal in primary
teeth. Moreover, Braun et al., [9] reported complete caries removal using Carisolv. Munshi et al., [10] reported that Carisolv did not completely remove the arrested carious dentine but there is strong evidence to support the concept that the partly demineralized, minimally infected inner carious dentine can be safely left behind.

Results of this study showed 60% of children sustained no pain, while 32% had mild pain and 8% had moderate pain. This finding suggests that the chemo-mechanical method can reduce the need for local anesthesia among primary school children aged 6 to 11 years.

This finding is in accordance with that of Beeley et al. [2], in which only 3 of the 107 patients in the Carisolv group experienced pain and necessitated anesthesia. The absence of pain with Carisolv may be due to the fact that sound dentin is not removed [6]. However, Chaussain et al., [11] reported that 39.2% of their patients sustained a tolerable degree of pain when being treated with Carisolv, whereas Munshi et al., [9] reported that none of their patients experienced any kind of pain during caries removal using Carisolv.

Variability in reported results of pain perception may be due to the subjective nature of pain, as well as variability of the pain threshold in each individual.

Katerina et al., [12] noted that the chemo-mechanical method of caries removal cannot fully replace the conventional methods, and its use is limited to specific cases such as young children with open cavities into dentine where minimum preparation is needed to access or perfect the cavity before the restoration of the tooth. The chemo-mechanical method might be useful with needle phobics and when local anesthesia is contraindicated, such as with immunocompromised patients or patients with a bleeding disorder.

In conclusion, Carisolv is an effective clinical alternative of treatment for the removal of occlusal dentinal caries. It is almost painless, non-invasive technique of caries removal. It is of potential interest for use in clinical pediatric dentistry.

References
تقييم الطريقة الكيميائية الميكانيكية (كاريسولف) للتنخل من الدنتين المسوغ لدى تلاميذ المرحلة الإبتدائية

هدف البحث: إجراء التقييم الإكلينيكي لفاعلية الكاريسولف على تسوس الدنتين لدى تلاميذ المرحلة الإبتدائية وقياس درجة إحساسهم بالألم.

منهجية البحث: أجريت هذه الدراسة في عام 2011 على 100 شخصاً من المرحلة الإبتدائية (26 مثلاً، و26 نائماً). تراوحت أعمارهم بين 6 إلى 11 عاماً، من بين المدرسين على عبادة أسنان الأطفال بكلية طب الأسنان بجامعة الملك خالد، بمدينة أبها، المملكة العربية السعودية. وقد تم علاج الدنتين المتسوس بالطريقة الكيميائية الميكانيكية (كاريسولف). وقد تم تقييم الرقمي لفاعلية تلك الطريقة في إزالة التسوس بإعطاء درجة تراوحت بين صفر (مئة إزالة التسوس تماماً) حتى 5 (إستمرار التسوس في قواعد ونجران وجوانب الفجوة). كما تم تقييم شدة الألم التي شعر بها التلاميذ أثناء إجراء الكاريسولف من خلال مقياس ألم الأوجه، والذي تراوحت بين صفر (وجه متوسط = لا يوجد آلم حتى 3 (وجه بيكيء، إلم شديد).

النتائج: أمكن التنخل التام من التسوس في 74% من التلاميذ، ولم يعاني 10% منهم من آلام، بينما شعر 26% منهم بالألم بسيط.

الاستنتاجات: إن طريقة كاريسولف ذات فاعلية إكلينيكية، ويمكن تطبيقها للتخلص من تسوس الأسنان الإسدياني. وهي طريقة غير مؤلمة وغير نافقة للتخلص من التسوس، ويمكن تطبيقها في نطاق طب الأسنان الأطفال.