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Review Article

# The Benefits of Using the Chemo-Mechanical Caries Removal System and the Mechanism of Action. (Review Article)

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**Received:** May 11, 2021; **Published:** May 31, 2021

## Abstract

**Objective:** With the introduction of Carisolv's newest technologies for caries removal, this Review article updates current information on this conservative chemo-mechanical caries removal method. It is believed that it can reduce the need for anesthesia, maintain tooth structure, minimize the use of rotary instrument, and effectively alleviate anxiety.

**Materials and Methods:** We'll look at the latest electronic resources: Trials Register of the Cochrane Oral Health Community, Central Register with Clinical Studies, MEDLINE, EMBASE, and PubMed. There would be no limitations on the terms used or the release date. We still intend to search article reference lists and contact experts and associations to see if there are any additional studies.

**Criteria for Selection:** The following will be considered for inclusion in this study: random control clinical studies, cohort studies, surveys, or case control studies, as well as ADA regulations and guidelines. use of chemo-mechanical method for caries removal. Studies older than 1980, non-blinded clinical trials, and studies documenting the physical and mechanical properties of Carisolv will be exception because these treatments will be tested in different studies.

**Data Collection and Analysis:** The two authors are expected to conduct their study separately. For every study that satisfies the inclusion and exclusion requirements, two separate authors will determine the likelihood of bias. The review of the literature and conceptual modeling are the key research methods used in this analysis. A first step toward a complete understanding of the Carisolv issue is to identify and classify the causes using a systematic approach. This research would also look at the different forms of Carisolv risks and their features. Dependent on this knowledge, a classification technique to classify these reasons factors for the purpose of identification will be established. In this study, the impact of various types of etiological factors will be extensively analyzed and categorized.

**Results:** The following are the results of the search: Sixty research papers on the topic were found. Only sixteen research papers are approved after exclusion criteria are applied.

**Conclusion:** The success or failure of material selection and proper handling is dependent on dental practitioners' knowledge and understanding of Carisolv material compositions, classifications, indications and contraindications, and chemo-mechanical method for caries removal.

***Keywords:*** *Carislov; Clinical Recommendations; Guideline; Anti-Cariogenic Agent; Chemo-Mechanical; A Traumatic Technique*

## Introduction

Caries in the teeth has been known since the dawn of time. Despite significant reductions in the incidence of caries in developed countries, the disease remains prevalent throughout the world. It is important to use conservative procedures to avoid lesion progression while also minimizing health tooth structure wear once it has been mounted [1]. Stress, panic, and pain are by far the most severe issues faced during caries removal. The handpiece's distracting noise, as well as pressure and heat during mechanical preparation, are to blame. Moreover, mechanical bur drilling often results in excessive preparation of sound, healthy dentin, which can result in pulp inflammation and even exposure. The advancement of systems for caries removal and cavity preparation has been pushed hard in the direction of minimally invasive procedures and improved patient comfort. To gain entry to the carious lesion, a drill with a high-speed handpiece was used, followed by a slow handpiece to remove the carious dentine. Many patients found this uncomfortable and painful, necessitating the use of local anaesthesia to alleviate the discomfort [2]. The drill eliminates both infected and affected dentine, causing excessive weakening of the tooth structure and increasing the risk of pulpal tissue damage [3]. Many alternative cavity preparation and caries removal approaches have been developed in recent decades, including traumatic restorative treatment, air abrasion, Chemomechanical systems, and most recently, hard tissue lasers [4]. Since it allows for the selective removal of carious dentine while avoiding the painful and unwanted removal of sound dentine, this procedure has grown in popularity. This procedure has gained importance due to the selective removal of carious dentine and avoidance of painful and unnecessary removal of sound dentine. Materials that bind to the dentine surface, such as composite resins or glass ionomer, are used to restore cavities prepared using this method, rather than materials like amalgam, which require the cutting of the cavity to mechanically preserve the restoration [5].

### Techniques of selective removal of caries

One of the most important implementations of the minimal intervention dentistry paradigm developed in the last decade is the theory of minimally invasive caries removal [6]. For the removal of infected dental tissue, laser ablation [7], air abrasion [8], sono-abrasion [9] or chemo-mechanical agents [10] have significantly helped minimal intrusive caries removal techniques. The removal of caries-infected tissue selectively while leaving caries-affected tissue intact is a common feature of these techniques. The 'caries-affected' dentine is identified by intertubular dentine demineralization, crystal deposition in tubules, limited collagen matrix damage, and no bacterial invasion [11]. The 'caries-infected' dentine, on the other hand, exhibits microstructural distortion of the dentinal tubules, permanent denaturing of the collagen fibers, and significant bacterial invasion [11]. During caries excavation, the latter damaged tissue should be removed. Chemomechanical caries removal is based on the use of a solvent to chemically modify carious tooth tissue in order to soften it further and make it easier to remove. Excavaters is used to mechanically remove the softened dentine. In the 1970s, different agents such as ethylene diamine tetraacetic acid (EDTA) [12], collagenase [13,14] and sodium dodecyl sulfate were used in the first attempts [13]. The majority of these systems proved to be too time consuming to be useful in clinical settings. More recently, other agents have become available; the best known is Carisolv (Mediteam, Sweden). Several chemomechanical caries removal agents have been phased out or modified over the last decade. A new agent has also been launched, with a third currently being created.

### Alternative method of caries removal in children

Chemomechanical caries removal is an alternative technique of caries removal (CMCR). It's also gentle and does not damage the tooth structure. It does not have any complication during the procedure. It was known as a non-invasive method of removing carious dentine. Chemomechanical technique has gained acceptance, especially from children and patient with anxiety. Minimal intervention dentistry not only reduces the pain associated with caries removal, but it also reinforces in children a positive attitude toward dentistry [15,16]. Among all techniques, a traumatic restorative technique is the most documented alternative to traditional drilling for dentine caries removal, but CMCR holds a lot of promise as an effective alternative to the traditional method. It entails applying a chemical solution to the cari-

ous dentine, then gently removing it with hand instruments. CMCR is a biologically mediated approach for removing dentine caries with reduced invasiveness and gentleness [16].

### Types and mechanism of action

There are two layers of dental caries: an inner layer and an outer layer. Infected and demineralized dentin make up the outer layer of the dentin. The inner layer, on the other hand, is made up of a demineralized layer of dentin that is less decalcified and free of bacteria [17]. The conventional method involves removing both the infected or external layer and the infected or internal layer. So, a method of caries excavation which is a chemicomechanical method of caries removal will act with a different mechanism of action. Carisolv gel is used in this method, which eliminates the outer layer while leaving the inner layer intact for future remineralization [18]. Thus, in 1998, Carisolv (MediTeam Dentalutveckling AB, Savedelen Sweden) was launched, which was made up of one component sodium hypochlorite and three amino acids (lysine, glutamic acid, and leucine). When the two parts are mixed together prior to the treatment, the acids become chlorinated, which improves the effect of sodium hypochlorite on denatured collagen while reducing the presence of healthy hard dental tissue [19]. Carisolv's antimicrobial effect is often attributed to sodium hypochlorite. It may be the preferred method in pediatric dentistry because it makes the child more comfortable, and the child cannot feel the vibrations and pain during treatment [20]. Carisolv's main goal is to remove only soft and infected tooth structure while leaving healthy tissue behind.

### Carisolv™ technique vs. conventional rotary drill method

In every field of dentistry, there is a need for tooth tissue preservation combined with a patient-friendly approach. The best restorative dentistry strategy for extending the life of a natural tooth is to use minimally invasive procedures to protect the healthy tissue from further damage [21]. Chemomechanical caries removal, for example, is widely regarded as a viable alternative to the conventional rotary drilling process. Marquezan and coworkers attempted a meta-analysis in 2006, comparing the efficacy of chemomechanical studies with traditional drilling techniques for caries removal. Marquezan., *et al*. observed that the research available at the time lacked evidence-generating capacity [22,23]. Given the numerous systematic, randomized clinical trials that have been published in recent years, generating clinical evidence for the use of chemomechanical caries removal methods is critical.

### History of chemo-mechanical method

Chemomechanical dentinal caries removal is a non-invasive alternative to mechanical, laser [24], kinetic cavity preparation [25] and atraumatic restorative therapy [26]. In 1975, the first study of a chemomechanical method for caries removal was released [27] and it was marketed under the trade name Caridex. (National Patent Medical Products, New Brunswick, NJ). Caridex, on the other hand, was unable to achieve clinical success due to a long working period and ineffective instruments. Carisolv, a new chemomechanical caries removal device recently launched in Europe [28], appears to be more promising. In 1998, the first *in vitro* study of Carisolv's use in primary and permanent teeth was reported [29]. Carisolv was said to be successful at removing caries.

## Conclusion

The success or failure of material selection and proper handling is dependent on dental practitioners' knowledge and understanding of Carisolv material compositions, classifications, indications and contraindications and chemo-mechanical method for caries removal.

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**Volume 20 Issue 6 June 2021**