

Chemomechanical caries removal in children

Efficacy and efficiency

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The development of alternative and more preservative, selective methods for caries removal could revolutionize operative dentistry in the age of searching for minimally invasive procedures. Chemomechanical caries removal (CMCR) has been introduced as an alternative method of caries removal. CMCR is a method of caries removal based on dissolution. Instead of drilling and using sharp excavators, this method uses a chemical agent assisted by an atraumatic mechanical force to remove soft carious tooth structure. The available CMCR system uses a gel, containing sodium hypochlorite and three amino acids (glutamic acid, leucine and lysine) as active ingredients and blunt instruments to selectively remove the denatured dentin, leaving the affected dentin intact.^{1,2} A comprehensive overview of various methods of caries removal has been published by Banerjee and colleagues.³

In vitro evaluations of the clinical effectiveness of CMCR showed that caries removal could be achieved.^{1,4} In addition, the effect of CMCR on sound dentin^{5,6} and carious dentin^{7,8} has been explored. Most findings

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ABSTRACT



Background. The authors investigated the effectiveness of chemomechanical caries removal (CMCR) compared with the traditional method (TM) of caries removal using a round bur when treating dentinal-depth occlusal lesions with minimal enamel access in primary molars. The authors also compare CMCR with TM to determine if it had a higher efficacy and could be used more frequently without the subject's having to undergo local anesthesia.

Methods. The authors collected data from 50 children during operative appointments at which caries was removed using one of the two methods.

Results. Complete caries removal within 15 minutes was achieved in only 57.7 percent of the CMCR-treated teeth. In 42.3 percent of these teeth, residual caries was removed using TM. CMCR was almost eight times more time-consuming than was TM when used to excavate dentinal-depth occlusal lesions with minimal cavitation. There was no significant difference between CMCR and TM in the number of subjects who needed to undergo local anesthesia.

Conclusions. The authors found no direct clinical advantage in using CMCR over using TM for treating occlusal dentinal lesions with minimal cavitation in pediatric patients.

Key Words. Dental restoration; pediatric dentistry; carious lesions; caries; dental cavity preparation.

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TABLE 1

Overview of clinical studies with pediatric patients comparing CMCR* and TM.†							
STUDY (YEAR)	PATIENT AND TOOTH CHARACTERISTICS					EFFICACY	EFFICIENCY
	Patients (No.)	Age Range (Years)	Tooth Type	Lesions (No. Evaluated)	CMCR/TM	Complete Caries Removal Not Achieved (%)	Time‡ (CMCR versus TM)
Maragakis and colleagues ¹⁷ (2001)	16	7-9	Primary	32	16/16	37.5 (15 minute time limit)	Significantly more than 20 times
Munshi and colleagues ¹⁸ (2001)	—	3-12	Primary and permanent	50 (30 soft; 20 hard)	50/0	Soft: 16.7 Hard: 90.0	Hard versus soft Hard more than 1.3 times soft
Attari and colleagues ¹⁹ (2001)	—	4-11	Primary	80	—	—	Significantly more than three times
Kavvadia and colleagues ²⁰ (2004)	31	2-9	Primary	92 (32 posterior)	22/10 (Class I)	0 (continued until clean)	Significantly more than three times
Bergmann and colleagues ²¹ (2005)	46	4-11	Primary	92	46/46	0 (continued until clean)	Considerably more than two times
Balciuniene and colleagues ¹⁶ (2005)	30	3-13	Primary: 63% Permanent: 37%	59	30/29	60	Considerably more than two times
Lozano-Chourio and colleagues ²² (2006)	40	7-9	Primary	80	40/40 (high-speed only)	0 (continued until clean)	Significantly more than three times

* CMCR: Chemomechanical caries removal.
† TM: The traditional method of caries removal using a round bur.
‡ Difference of time needed for CMCR compared with that needed for TM.

supported the claim that CMCR is clinically efficacious and similar to the traditional method (TM) of caries removal using a bur. Some studies, however, have found up to 70 percent residual caries after CMCR has been used for up to 15 minutes.⁸⁻¹¹ While complete caries removal was achieved in most cases,¹²⁻¹⁵ the time required time for CMCR was significantly longer than the time for TM. Only Nadanovsky and colleagues¹⁵ reported similar average treatment times when they compared CMCR with excavation with hand instruments only. Overall, a majority of the studies concluded that the clinical use of CMCR was efficacious and more comfortable for the patient.

Pediatric patients and CMCR. Seven studies investigated the use of CMCR in pediatric treatments compared with the use of TM (Table 1).¹⁶⁻²² Studies investigating efficacy concluded that complete caries removal was not achieved in 16.7 to 90.0 percent of the cases. All of the studies reported longer to considerably longer time (> three times) was needed for CMCR compared with TM.

While the seven studies were important steps

in the assessment of the outcomes of CMCR in children, they had some limitations such as lack of a control group,¹⁸ failure to take baseline measurements with respect to cavity characteristics^{16,18,23} and treatment differences among study groups.^{17,20,22}

The purpose of our prospective, randomized controlled clinical trial was to compare CMCR and TM concerning efficacy (in achieving complete caries removal in well-described occlusal lesions into dentin with limited enamel involvement in primary molars), efficiency and the need for local anesthesia when treating patients. Results concerning operators' and pediatric patients' responses to both methods will be reported in an article about the psychosocial and behavioral outcomes of this study.²⁴

METHODS

The Institutional Review Board (IRB) for the Health Sciences at the University of Michigan, Ann Arbor (IRB file H03-0001466) and the Institutional Review Board of Mott Children's Health Center, Flint, Mich. approved our randomized controlled study. We obtained written assent from

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