



'CARIE CARE' A NOVEL METHOD OF CARIES REMOVAL AND ITS EFFECTIVENESS: A RANDOMISED CLINICAL TRIAL

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ABSTRACT

Context: Newer methods of caries removal have been developed as an alternative to conventional methods to overcome few of these drawbacks. Chemo-mechanical caries removal (CMCR) is one such alternative and is based on the concepts of minimal invasive dentistry.

Aim: To evaluate and compare the effectiveness of chemo-mechanical caries removing agent (carie- care) with conventional drilling method (CDM).

Settings and Design: A randomised controlled clinical trial to evaluate the effectiveness and patient compliance using conventional and chemo-mechanical caries removal method.

Methods and Material: 28 healthy children in the age group of 6-8 years with class -I carious lesion with no clinical or radiographic pulpal involvement are divided into two groups. Pulse oximeter is used to assess the anxiety levels at various time intervals during the procedure. Caries is removed using airtor in group I and CMCR in group II. Effectiveness of caries removal is assessed using caries detector dye and Ericson scale.

Statistical analysis used: Students t test and Chi square test

Results: There was no statistical significant difference in the pulse rate and oxygen saturation at different intervals of the procedure. On checking the effectiveness, both the CDM and CMCR showed no significant difference.

Conclusions: CMCR method eliminates the noise, conserves tooth structure and helps in maintaining cooperative behaviour of the children. It can be a better alternative to the conventional method of caries removal.

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INTRODUCTION

Caries removal by means of conventional instruments is considered an unpleasant step of the restorative process mainly because of pain, drilling and noise (Banerjee *et al.*, 2000). The dental drill (air-rotor) and injection are the two most dreaded tools in the dental armamentarium. Newer methods of caries removal have been developed as an alternative to conventional methods to overcome few of these drawbacks. The objective of chemo-mechanical agents is to remove the infected layer, leaving the affected demineralized dentin that is capable of being re-mineralized and repaired (Reddy *et al.*, 2015). Chemo-mechanical caries removal (CMCR) agents act by degradation of the partially degraded collagen in the infected dentine, without causing any damage to normal dentinal tissues (Kittu Jain1, 2015).

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Anxiety is one of the major issues when delivering dental treatment to children and the injection is the most anxiety provoking procedure for both children and adults.(4)As anxiety and pain is not reliable and reproducible in children, other mode of assessment becomes necessary. Aim of this study was to evaluate and compare the effectiveness of chemo-mechanical caries removing agent (carie- care) with conventional drilling method (CDM).

SUBJECTS AND METHODS

This randomised parallel design clinical trial was conducted on 28 healthy children in the age group of 6-8 years who had class I open carious lesion on primary molar teeth without any clinical or radiographic pulpal involvement. Only children in their first dental visit were included in the study. Institutional ethical committee approval was taken. Teeth with deep dentinal caries involving the pulp, medically or

physically compromised children were excluded from the study. Informed consent was obtained from the parents. Pulse oximeter was used to assess the anxiety levels at the beginning of the procedure. After the selection, they were randomly divided into two groups. Caries removed using airotor in group I and Carie Care (Figure 1) in group II. Intra-oral periapical radiographs of the teeth were taken to assess the extent of the caries. Pulse oximeter was placed on the child's right index finger (Figure 2) to assess the physiologic response (oxygen saturation and pulse rate) at various stages of the procedure. It was recorded at 4 intervals (before the procedure, during the procedure, immediately after procedure and five minutes after the procedure). In the CMCR group, caries excavation was done by applying the gel directly on the caries surface and removing the caries using a spoon excavator after 30 seconds. This was repeated until complete caries removal was obtained. In CDM group the caries removal was done using airotor and round bur in a slow speed. After caries excavation a dentin caries detector dye (Figure 3) was applied in the cavity. The effectiveness of both the group was assessed using Ericson *et al* scale.

RESULTS

Student's t test was used to compare the oxygen saturation (Table 2, Graph 1) and pulse rate (Table 3, Graph 2) showed no significant difference at different time intervals. Effectiveness was compared using Chi square test showed no significant difference between CDM and CMCR method of caries removal (Table 4, Graph 3).

Table 1. Ericsson scale

Score	Definition
0	Complete caries removed
1	Caries present in the base of the cavity
2	Caries present in the base and/or one wall
3	Carie present in the base and /or two walls
4	Caries present in the base and/or more than two walls
5	Caries present in the bases, walls and margins of the cavity

DISCUSSION

Chemo-mechanical caries removal agents are desirable in pediatric dentistry as it eliminates use of airotor, increases patient's compliance (Chaussain-Miller *et al.*, 2003) and preservation of tissue. The chemo-mechanical method of caries removal has a disintegrating effect on caries tissue, while leaving healthy dentin largely intact (Avinash *et al.*, 2012). Anxiety may be defined as either a cognitive, emotional, and

physical reaction to a dangerous situation or the anticipation of a threat (Wilson, 1999).

Table 2. Student's t test for oxygen saturation

Chi-Square Test					
		GROUP			P
		CHEMICO-MECHANICAL	AIROTOR		
ERICSSON SCORE	SCORE 0	Count	4	7	0.246
		% of Total	14.3%	25.0%	
	SCORE 2	Count	10	7	
		% of Total	35.7%	25.0%	

Table 3. Student's t test for pulse rate

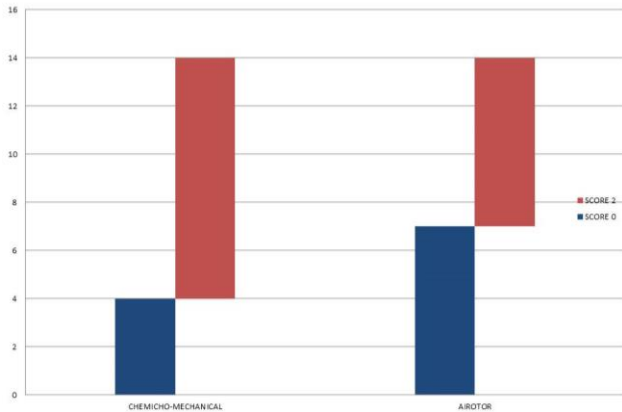
Student's t Test					
	GROUP	Mean	Std. Deviation	t	p
PR before the procedure	CMCR	97.214	11.969	-0.138	0.892
	CDM	97.857	12.714		
PR during the procedure	CMCR	90.428	24.898	-0.756	0.457
	CDM	96.000	11.871		
PR after the procedure	CMCR	94.357	11.317	0.053	0.958
	CDM	94.142	10.060		
PR five mins after the procedure	CMCR	93.928	13.117	1.284	0.210
	CDM	88.571	8.464		

Table 4. Ericsson score

Student's t Test					
	Group	Mean	Std. Deviation	t	p
SpO2 before the procedure	CMCR	98.642	1.081	-1.229	0.230
	CDM	99.071	0.730		
SpO2 during the procedure	CMCR	98.571	0.513	-0.374	0.712
	CDM	98.642	0.497		
SpO2 after the procedure	CMCR	97.714	2.867	-1.383	0.178
	CDM	98.785	0.425		
SpO2 five mins after the procedure	CMCR	98.285	0.726	1.343	0.201
	CDM	97.000	3.508		

There is a strong relationship between a child's dental anxiety and successful dental treatment and also between anxiety and pain (Wright, 2000). Dental anxiety in children has been recognized as a problem in patient management for many years. The effects of this anxiety have been shown to persist into adulthood, which can often lead to dental avoidance and the subsequent deterioration of oral health. Bergmann *et al.* reported anxiety levels and lower degrees of pain with CMCR group when compared to rotary group (Bergmann, 2005). Attari *et al.* found no significant difference in the anxiety levels before and after treatment in both CMCR and rotary groups. To record these physiological changes, pulse oximeter,

a non-invasive technique is widely used in dentistry. It helps in real-time recording of physiological parameters such as blood pressure, pulse rate, oxygen saturation, and body temperature (Dedeepya *et al.*, 2014).



Graph 1. Comparison of oxygen saturation



Graph 2. Comparison of pulse rate



Graph 3. Comparison of Ericsson score



Figure 1. Carie care

Poiset *et al.* found an increase in heart rate when using a high-speed hand piece and during atraumatic restorative technique (Poiset *et al.*, 1990). Rayen R *et al* showed a significant change in heart rate in all the situations in the dental operatory area where as oxygen saturation remained unchanged. A similar study conducted by Priya *et al.* also showed no significant difference in behavioural response between CDM & CMCR method of caries removal. The efficacy of caries removal was assessed by Rajkumar *et al* showed that airtor is more effective than carie care. Comparison of efficacy, time taken and pain with carie care, rotary and hand excavation in caries removal. Results showed that efficacy is more with airtor, followed by carie care and least for hand excavation (Rajakumar *et al.*, 2013). However in contrast, Banerjee *et al* stated that chemo mechanical method was the least effective. Maragakis *et al* reported that the efficacy of caries removal by chemo method was only 62.5% showing that it did not remove the caries efficiently and therefore it cannot replace the rotary instruments (Maragakis *et al.*, 2001). The result of this study indicated that the chemo-mechanical method and airtor have same effectiveness in removal of caries in primary teeth. Peters *et al* concluded that chemo-mechanical caries removal had lower efficacy and efficiency when treating dentinal depth occlusal lesions with minimal opening. Watson *et al.* had also found that the carisolv method was as effective as bur in removing infected dentin (Banerjee *et al.*, 2000). Traditional means of cavity preparation involves high-speed hand piece and slow rotating instruments. However, this modality of cavity preparation usually induces pain, annoying sounds, and vibration. It often removes parts of tooth which are healthy, in addition to the decayed areas.

Chemo-mechanical caries removal (CMCR) is a non-invasive technique, which eliminates infected tissues, preserves healthy tooth structures and avoids pulp irritation, thus minimizing patient discomfort. It also has the benefits of antibacterial and anti-inflammatory action (Geetha Priya, 2014). Carie care showed the same effectiveness as that of conventional method in caries removal. It can be a suitable alternative to airtor in anxious, uncooperative children and children with special health care needs.

Conclusion

Within the limitations of this study it can be concluded that even though a similar effectiveness and patient compliance was found between the two groups chemo-mechanical caries removal method outweighs as it hides the decibels and raises the zeal in tiny tots who else might succumb to the sonance of dental operatory.

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