

Comparison of the Efficacy of Chemicomechanical Caries Removal with Conventional Methods - A Clinical Study

Pallvi Goomer¹, R L Jain², Harsimrat Kaur³, Rahul Sood⁴

¹Sr. Lecturer, Department of Pediatric & Preventive Dentistry, B.R.S Dental College & Hospital, Panchkula, Haryana, India; ²Former Director-Principal, Professor & Head of Department, Pediatric & Preventive Dentistry, Guru Nanak Dev Dental College & Research Institute, Sunam, Punjab, India; ³Professor & Head, Department of Pediatric & Preventive Dentistry, Luxmi Bai Institute of Dental Sciences & Hospital, Patiala, Punjab, India; ⁴Professor & Head, Department of Oral & Maxillofacial Surgery, Maharaja Ganga Singh Dental College, Sri Ganga Nagar, Rajasthan, India.

ABSTRACT

Background: There has been considerable interest in developing alternative methods of cavity preparation and caries removal due to disadvantages of using traditional rotating instruments which can result in heat, pressure, dentin desiccation, vibration and pain. Hence, the aim of this study was to compare different methods of caries removal in terms of efficacy, time taken and pain during caries removal.

Materials & Methods: A total of 150 carious teeth were selected among 80 children of 6-10 years of age, following Radiovisiography (RVG) according to specific inclusion criteria and caries removal was done by hand instruments, air rotor and carisolv respectively. The efficacy, time taken and pain threshold were evaluated during caries removal by *Ericson D et al scale*, Time scale (*Raber H et al*), visual analogue scale (*Nayak R et al*) and verbal pain scale (*Cinzia Brunelli et al*) respectively. Data was collected and statistically analysed.

Results: Mean value of time taken for removal of caries by carisolv group (580.26 sec) was found to be significantly higher as compared to conventional hand excavation and air rotor. Air rotor was found to be the most efficient method (mean value 1.20). Mean value of pain perception was significantly less with carisolv (0.82) as compared to air rotor and hand instrument.

Conclusion: It was concluded that chemicomechanical removal of caries with Carisolv was found to be effective measure of caries removal and could be considered as viable alternatives to painful procedures like airtor in management of dental caries especially in children.

Key Words: Carisolv, Caries removal, Pain.

How to cite this article: Goomer P, Jain R L, Kaur H, Sood R. Comparison of the Efficacy of Chemicomechanical Caries Removal with Conventional Methods - A Clinical Study. *J Int Oral Health* 2013; 5(3):42-47.

Source of Support: Nil

Conflict of Interest: None Declared

Received: 18th March 2013

Reviewed: 6th April 2013

Accepted: 22nd April 2013

Address for Correspondence: Pallavi Goomer. BRS Dental College & Hospital, Panchkula, Haryana, India.
Phone: +91 – (0) – 9876454935. Email: pallvi6@gmail.com.

Introduction

The historical resume of etiology of dental caries presents an interesting fact as; more has been written and less is known of this disease than any

within the last decade, understanding of its dynamic nature lead to a risk factor approach which left the treatment of cavities a minor role to play in the whole planning¹.

The profession is slowly progressing from “finding and filling” to “early detection and management”. Dentists adopting this treatment philosophy have fewer cavities to fill and more surfaces to save. The concept of minimal intervention dentistry not only eliminates the pain associated with the removal of caries but also instills a positive attitude in children towards dentistry². The chemico-mechanical caries removal system “Carisolv”, has been developed with the purpose of removing all the infected tissue, preventing the removal of sound dentin, is intended not to cause discomfort to the patient and is based on biological principles³. The treatment is quiet and comfort. The Present investigation aimed to evaluate and compare the chemico-mechanical caries removal with that of

conventional means with respect to efficacy of caries removal, caries removal time, reported pain severity in deciduous molars with moderate dentinal involvement.

Materials and Method

The present study was conducted in the department of Pediatric and Preventive Dentistry, Guru Nanak Dev Dental College and Research Institute, Sunam. The study sample consisted of 80 children having age ranging from 6-10 years from the department OPD. All children were healthy, without history of systemic diseases, hereditary anomalies or any prior medication during the study. Ethical clearance was obtained for the study. The study design, objectives, potential benefits and methodology were explained to the selected children and their parents and written parental consent was obtained prior to the study. 150 primary molars were selected from these children. Carious teeth were called “Samples” and were randomly divided into three groups. Group A comprised of caries removal using Carisolv Gel in which gel was used and applied with help of specially designed multistar instrument in 50 carious teeth (figure 1). In Group B (figure 2) Caries removal was done using Air rotor. This group also comprised of 50 carious teeth, in which



Fig 1: Caries removal using specialized instrument & Carisolv gel.



Fig 2: Caries removal using Air rotor.



Fig 3: Caries removal using Hand instrument (spoon excavator).

the caries was removed using diamond round bur (MANI no. 45) along with adequate coolant. Third was Group C in which Caries removal was done

methods, the caries-detecting dye (propylene glycol) was again applied on carious lesion for one minute. Washing was done with water and the

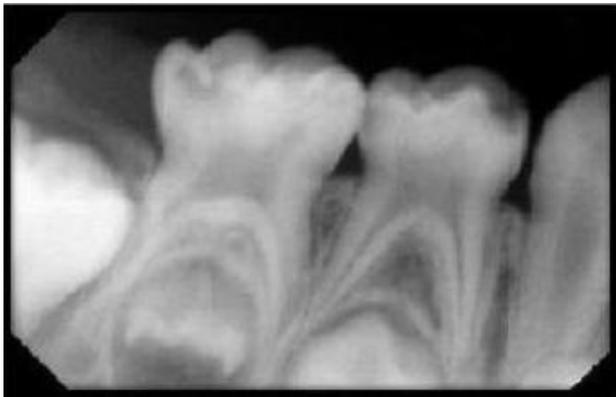


Fig 4: Radiovisiographic image of occlusal caries.



Fig 5: Radiovisiographic image of proximal caries.

using hand instrument i.e spoon excavator(API) (figure 3) Before starting the treatment, teeth were selected radiographically using RVG (Digital radiovisiography). and these were scored according to the radiographic criteria; [Ekstrand *et al* (1997)⁴ criteria for occlusal caries (fig 4) and Mialhe *et al* (2009)⁵ for proximal caries(fig 5)]. The selected tooth was isolated using rubber dam. Caries detecting dye (Caries Detector) containing 1% acid red in propylene glycol was applied using an applicator tip and was washed with water. After the caries was removed by using different

efficacy, time taken and pain threshold were evaluated during the caries removal by Ericson D *et al.* scale⁶, time scale⁶, visual analogue scale⁷ & verbal pain scale⁸ respectively. Data was collected and statistically analyzed using one way anova & student t test.

Results

Time consumption with pain perception

Table 1 shows that the mean time required for caries removal with the chemicomechanical method (580.26 s +/-121.702) was longer than the

Table 1: Showing Comparison of mean values of the time taken for caries removal by different methods.

Groups	N	Mean	Sid Deviation	Sid Error	Minimum time	Maximum time
A	50	850.26	121.702	17.211	330	902
B	50	202.30	66.607	9.420	100	482
C	50	414.66	103.511	14.639	202	720
Total	150	399.07	184.240	15.043	100	902

Table 2: Showing Comparison of mean values of pain using visual analogue scale(VAS) score for caries removal by different methods.

Groups	N	Mean	Sid Deviation	Sid Error	Minimum time	Maximum time
A	50	20.40	12.282	1.737	10	60
B	50	77.20	19.799	2.800	40	100
C	50	60.40	13.087	1.851	20	80

* Group A: Carisolv , Group B: Airotor , Group C: Hand Instrument

time spent with the conventional methods i.e. 202.30+/-66.60 with air rotor and 414.66+/-103.51 with hand instrument respectively.

Table 2 shows that the mean value of pain score with Visual Analogue scale using the conventional methods i.e. with air rotor (77.2 ± 19.7s) and hand instrument (60.40+/-13.0) respectively was significantly greater as compared with the Carisolv (20.40+/-12.28) (p<0.01). The mean value of pain using Verbal Pain Scale as shown in Table 3 is much higher with conventional methods i.e. 2.72+/-0.607 with air rotor and 1.84+/-0.548 with hand instrument as compared to Carisolv in which it is significantly lower i.e. 0.82+/-0.2.

Discussion

Fear and anxiety are known barriers to the receptivity of dental treatment and in detriment to oral health. The conventional drilling techniques are associated with discomfort, especially among children. Moreover, the use of drill equally removes infected and affected dentin, resulting in excessive loss of healthy tooth structure.

The first chemico-mechanical caries removal system was introduced in 1975 by a formula, called GK 101[®]. It turned out to act slowly and additional efforts to speed up the procedure resulted in GK 101 E, in which the glycine was replaced by amino butyric acid. But due to large volumes of solution needed and the fact that the

Table 3: Showing Comparison of mean values of pain using verbal pain scale for all experimental groups.

Groups	N	Mean	Std Deviation	Std Error	Maximum time
A	50	0.82	0.833	0.825	3
B	50	2.72	0.303	0.607	4
C	50	1.84	0.490	0.548	3

Table 4: Showing comparison of mean values of efficacy of different methods in removing Caries.

Groups	N	Mean	Sid Deviation	Sid Error	Minimum time	Maximum time
A	50	1.2	0.833	0.118	0	3
B	50	0.48	0.303	0.043	0	1
C	50	2.62	0.490	0.069	2	3

* Group A: Carisolv, Group B: Airotor, Group C: Hand Instrument

Efficiency during caries removal

Table 4 depicts mean values of scores of remaining caries illustrating the efficacy of caries removal by different methods, along with statistical derivatives. Remaining caries was observed to be least with Airotor, therefore best efficacy of caries removal was observed with Air rotor (0.48/0.303) followed by Carisolv (1.20/0.833) and least by the hand instrument technique (2.62/0.490).

delivery system was no longer commercially available, the use of Caridex despite its potential became minimal in early 1990's. During this time, Mediteam in Sweden continued to work on a system and the latest CMCR reagent known as Carisolv was introduced¹.

In the present study, Carisolv was compared with the conventional techniques i.e. airotor & hand instrument. The study included children in the age

group of 6-10 years selected from department OPD. Only those patients who met inclusion criteria were included .

The results of this study showed that the primary molars treated with chemico-mechanical technique needed significantly more time for caries removal than with the primary molars treated with hand instruments and air rotor. This was in accordance with the study conducted by Banerjee et al (2001)¹⁰ who evaluated different methods of carious dentin excavation and found that air rotor was the quickest and Carisolv excavation was the slowest method of caries removal . Ericson et al (1999)¹ reported the mean caries removal time was 10.40 min with carisolv and 4.42 min with rotary instruments. This is comparable with the treatment time found in the present study .Similar results were obtained by Maragakis et al¹¹ and Fure et al studies.

For pain perception Visual Analogue Scale and Verbal pain scale were used.VAS scale developed by Huskison EC, is a reliable and valid manner to describe the perception of pain of a child as young as 6 years of age. This scale was used in various clinical studies done by Allen KL et al, Eaton JJ et. al and Anusavice et.al.¹

Traditionally verbal pain scale was first described by Keele in 1948. In the present study this scale was used as it was simple, descriptive and more informative about the type of pain. In this study it was derived that out of the three methods adopted in the present investigation, Carisolv method seems to be less painful with respect to caries removal.

Hence it was observed that out of all the three methods used for caries removal , Carisolv proved to be an effective, virtually painless and non invasive technique but time consumption is more.

Conclusion

Chemico-mechanical method is extremely comfor method and is successful in achieving child co-

operation. Thus, it was concluded that although it is difficult to employ any one single method to achieve clinical excellence as well as objective of minimal intervention dentistry, chemico-mechanical being patient friendly method have a promising application in pediatric dentistry. As carisolv is more time consuming further studies should be carried out to find such material which consumes less time & has same efficiency.

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