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Original Article

CLINICAL EVALUATION OF CHEMO-MECHANICAL CARIES REMOVAL USING CARIE-CARE SYSTEM AMONG SCHOOL CHILDREN

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Abstract :
Dental caries is considered as one of the most serious dental diseases that results in localized dissolution and destruction of the calcified tooth tissues. As possible alternatives to conventional techniques of caries removal, chemo mechanical caries removal systems have emerged. AIM: To clinically observe the advantages of Chemo-mechanical method of caries removal over Conventional technique. MATERIALS AND METHODS: A total of 64 teeth of 32children with class 1 open carious lesions were selected for the study from the school dental clinic after taking written consent. They were divided into two equal groups according to method of caries removal (32 chemomechanical and 32 conventional from both primary and permanent teeth respectively) . In Group I, caries was removed using the carie-care system and in Group II, with the conventional drill and were restored equally with amalgam and ketac molar respectively. The restored teeth were followed up after 1 week, 1 month, 6 months and 1 year respectively for its clinical success. RESULTS: The results were subjected to statistical analysis using students paired t-test and chi-square tests. It showed that though Chemomechanical technique took a marginal increase in time compared to the conventional technique, it was found to be more comfortable for all the children. Amalgam restorations showed better retention compared to ketac molar restorations in both the techniques. CONCLUSION: Chemomechanical technique though time consuming is definitely superior compared to conventional technique in pediatric dentistry, provided we use a less technique sensitive restorative material which retains in the oral cavity for longer period of time. It is definitely a better treatment protocol in school based dental treatment compared to conventional technique

Keywords : carie-care, caries, chemo-mechanical agent

Introduction :

Dental caries is considered as one of the most serious dental diseases that results in localized dissolution and destruction of the calcified tooth tissues. Neglecting the treatment of this disease, could also endanger the tooth pulp.[1] However, caries treatment procedures are usually associated with unpleasant patients' sensation. Several approaches for removing and treating dental caries have been tried seeking for more comfort. Caries removal in decayed teeth has conventionally been performed using the mechanical cutting and drilling system. However, these methods have some major disadvantages. First, mechanical preparation often induces pain, and local anaesthesia is thus needed. Second, it is often difficult to establish how much tooth material should be removed, which often leads to overextended cavities. As possible alternatives to conventional techniques, chemo mechanical caries removal systems have emerged.[2] It was introduced to dentistry as an alternative method of caries removal and is mainly indicated to overcome the inconvenience of using burs and local anesthesia, hence causing less discomfort to patients and preserving healthy dental structure, there by complying the concept of the minimal invasive dentistry (MID).[3] Caridex, carisolv are some of the chemomechanical organic caries removal agents. Latest material in this field being 'Carie –Care'

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which is a gel based formulation containing a purified enzyme, derived from the plant Carica papaya (Papaya) has emerged which exhibits anti- bacterial and anti-inflammatory properties .It acts as a debris removing agent with no harmful effect on sound tissues because of the enzyme specify along with the benefits of Clove oil which is analgesic and antiseptic, was used for the noninvasive chemo-mechanical removal of dental caries in the present study. The study was conducted to do the comparative analysis of the advantages of Chemo-mechanical method of caries removal over Conventional technique in a school based programme where the conventional treatment facilities were not upto the mark.

Materials and Methods:

The study was conducted to evaluate clinically the efficiency of caries removal using a new chemo-mechanical agent (carie-care) compared to the conventional drilling method. This double blind study was done on a split mouth design. The study was carried out on children who were having two or more open asymptomatic carious lesions with intact dentine in the age group of 4-15 yrs. Informed consent was obtained from parents, guardians or teachers through the concerned authority to conduct the study. Children where only one cavity was present and children with pulpally involved teeth were excluded from the study. The study was performed on 64 class 1 primary and permanent open carious lesions (32 primary teeth and 32 permanent teeth). The children were randomly divided into two equal groups according to method of caries removal: group I and group II. Group I was further subdivided to group IA and group I B for primary teeth and permanent teeth respectively. Group II was further subdivided to group II A and group II B for primary and permanent teeth respectively. In Group I, caries was removed using the carie-care system and in Group II, caries was removed with the conventional drill.Time taken was noted. After the cavity preparation, the children were randomly divided into subgroup of eight children with bilateral cavities and were randomly restored with ketac molar and amalgam restorations. The follow up was done after 1 week, 1 month, six months and 1 year and the efficacy of the restoration was then assessed clinically.

Results :

The results were subjected to statistical analysis using students paired t-test and chi-square tests .Almost all patients found chemomechanical technique more pleasant and acceptable the average time taken for chemomechanical technique was 7 mins in primary teeth and 10.4 mins permanent teeth as in fig 1. The time taken for conventional technique was 4.9 mins in primary teeth and 7.5 mins in permanent teeth which was much lesser than the conventional technique which was statistically significant.

All the restored teeth was observed to be clinically intact and asymptomatic after 1 week. After 6 months, in Primary teeth, Amalgam showed the better retention with 100% success in conventional and was highly statistically significant and 88% success following chemomechanical technique. Ketac molar showed 38% success irrespective of the technique used which was much lower than amalgam restoration. After one year follow up, it was observed that some of the teeth had exfoliated and those that were present had the restorations intact.

Table 1 : comparison of amalgam and ketac in each group separately

Chi-Square Tests

primary/secondary	conventional/chemo		Value	Exact Sig. (2-sided)
PRIMARY	CONVENTIONAL	Pearson Chi-Square	7.273	.026
		N of Valid Cases	16	
	CHEMOMECHANICAL	Pearson Chi-Square	4.267	.119
		N of Valid Cases	16	
PERMANENT	CONVENTIONAL	Pearson Chi-Square	5.333	.077
		N of Valid Cases	16	
	CHEMOMECHANICAL	Pearson Chi-Square	.410	1.000
		N of Valid Cases	16	

conventional/chemo * EFFECT Crosstabulation

primary /secondary	amalgam /ketac			EFFECT FAILED	INTACT	Total
PRIMARY	AMALGAM	CONVENTIONAL	Count	0	8	8
			% within conventional/chemo	0.0%	100.0%	100.0%
			% within EFFECT	0.0%	53.3%	50.0%
		CHEMOMECHANICAL	Count	1	7	8
			% within conventional/chemo	12.5%	87.5%	100.0%
			% within EFFECT	100.0%	46.7%	50.0%
		Total	Count	1	15	16
			% within conventional/chemo	6.2%	93.8%	100.0%
			% within EFFECT	100.0%	100.0%	100.0%
	KETAC	CONVENTIONAL	Count	5	3	8
			% within conventional/chemo	62.5%	37.5%	100.0%
			% within EFFECT	50.0%	50.0%	50.0%
		CHEMOMECHANICAL	Count	5	3	8
			% within conventional/chemo	62.5%	37.5%	100.0%
			% within EFFECT	50.0%	50.0%	50.0%
		Total	Count	10	6	16
			% within conventional/chemo	62.5%	37.5%	100.0%
			% within EFFECT	100.0%	100.0%	100.0%
PERMANENT	AMALGAM	CONVENTIONAL	Count	0	8	8
			% within conventional/chemo	0.0%	100.0%	100.0%
			% within EFFECT	0.0%	57.1%	50.0%
		CHEMOMECHANICAL	Count	2	6	8
			% within conventional/chemo	25.0%	75.0%	100.0%
			% within EFFECT	100.0%	42.9%	50.0%
		Total	Count	2	14	16
			% within conventional/chemo	12.5%	87.5%	100.0%
			% within EFFECT	100.0%	100.0%	100.0%
	KETAC	CONVENTIONAL	Count	4	4	8
			% within conventional/chemo	50.0%	50.0%	100.0%
			% within EFFECT	80.0%	36.4%	50.0%
		CHEMOMECHANICAL	Count	1	7	8
			% within conventional/chemo	12.5%	87.5%	100.0%
			% within EFFECT	20.0%	63.6%	50.0%
		Total	Count	5	11	16
			% within conventional/chemo	31.2%	68.8%	100.0%
			% within EFFECT	100.0%	100.0%	100.0%

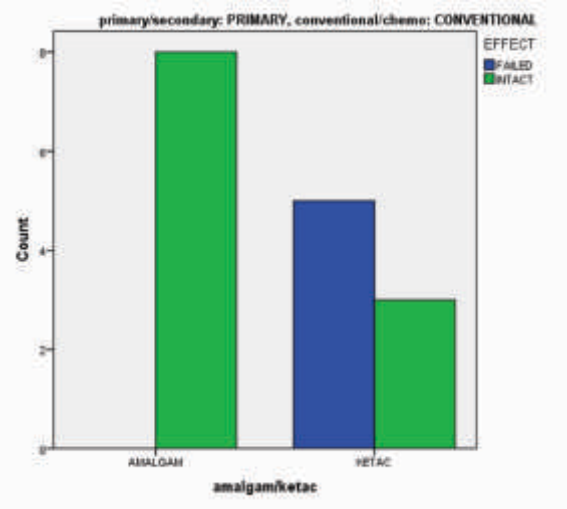
Table 2 : Comparison of the conventional and chemomechanical groups in each category

Chi-Square Tests

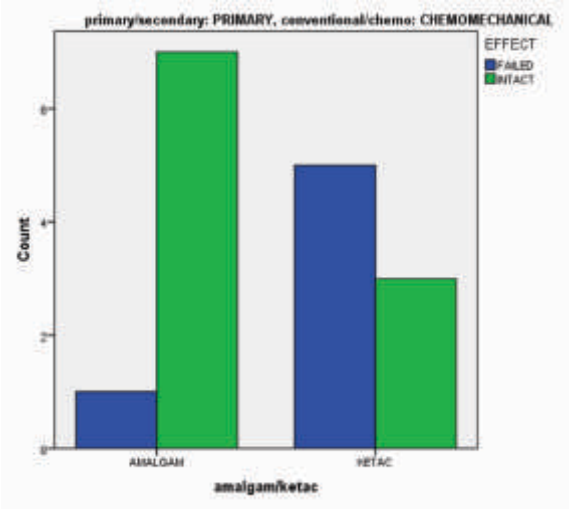
primary/secondary	amalgam/ketac		Value	Exact Sig. (2-sided)
PRIMARY AMALGAM	Pearson Chi-Square	1.067	1.000	
		N of Valid Cases	16	
	KETAC	Pearson Chi-Square	.000	1.000
		N of Valid Cases	16	
PERMANENT	AMALGAM	Pearson Chi-Square	2.286	.467
		N of Valid Cases	16	
	KETAC	Pearson Chi-Square	2.618	.282
		N of Valid Cases	16	

In Permanent teeth, amalgam showed 100%success in conventional technique and 75% success in chemomechanical technique. Ketac molar restorations showed 50% success in the conventional technique and 88% success in the chemomechanical technique .The same results were obtained after 1 year follow up also. However intact restorations were asymptomatic even after one month, six months. After one year follow up also the restorations were observed to be intact. Hence this proves that amalgam showed better retention compared to ketac molar restorations in both primary and permanent teeth and Ketac molar restorations were more successful in chemomechanical technique.

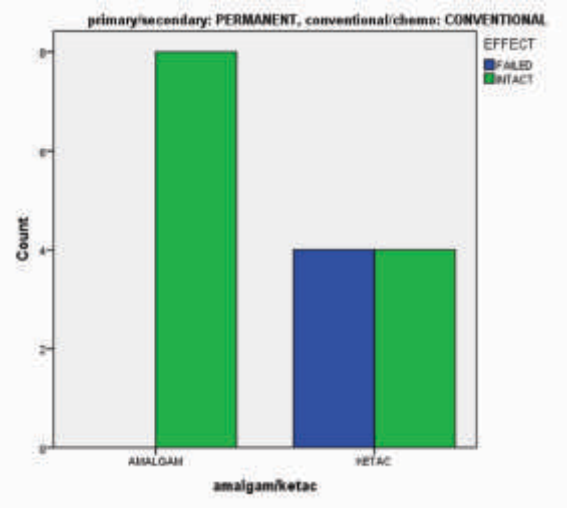
Graph 1 : Graph showing conventional preparation for amalgam versus ketac molar in primary teeth



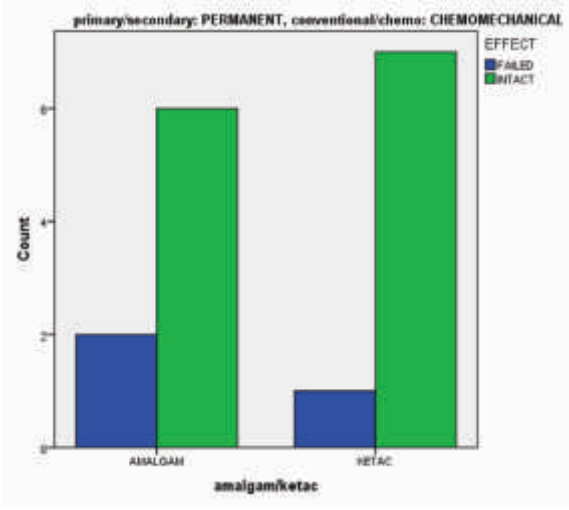
Graph 2 : Graph showing chemomechanical preparation for amalgam versus ketac molar in primary teeth



Graph 3 : Graph showing conventional preparation for amalgam versus ketac molar in permanent teeth



Graph 4 : Graph showing chemomechanical preparation for amalgam versus ketac molar in permanent teeth



Discussion :

Fear and anxiety are known barriers to the receptivity of dental treatment and in detriment to oral health. In children, it is difficult to differentiate between fear and anxiety-originated behaviour problems the conventional drilling techniques are associated with discomfort, [4] especially among children as was observed in the present study. In addition, it gets further triggered by factors like:a)local anesthesia, b)low and high speed rotary instruments, c)previous dental treatment.

The CMCR method is said to be 'very efficient' in soft caries

removal.[5] *In vitro* studies have shown chemomechanically treated dentin to have more surface energy, greater affinity for adhesive material, and better bonding than conventionally treated dentin. Moreover, morphological studies have shown Carisolv ® treatment to consistently remove the carious lesion and open the dentinal tubules along with more irregular and rougher surface with modified smear layer.[6]However in the present study, retention was poorer with adhesive material like ketac molar compared to amalgam following chemomechanical caries removal technique.It may be because of the technique sensitivity of ketac molar in a school based programme.

The time taken for chemomechanical technique in cavity preparation was found to be slightly higher than conventional drilling technique.This may be due to the multiple application of the Carie care for complete removal of caries .However the children were very comfortable compared to conventional technique.

Amalgam restorations showed better retention as compared to ketac molar restorations. They were found to be more retentive in conventional preparations than chemomechanical preparations. It may be due to the inability to comply with the retentive principles of cavity preparation for amalgam in chemomechanical preparation. Amalgam requires the cavity preparation principles like a)The parallelism or slight occlusal convergence of two or more opposing external walls ,b)flat pulpal floor and 1/4th intercuspal distance provides the primary retention form. c) Undercuts and also due to larger surface area in the permanent teeth.

Ketac molar restorations were found to be dislodged equally in both the techniques in primary teeth. Ketac molar restorations require moisture proof environment during restoration for its better retention. It also fails particularly in approximal cavities where the cement is relatively unsupported. Because of the brittleness of glass ionomer cement, it require support of the surrounding tooth structure, therefore the performance is better in single-surface cavities compared to multi-surface cavities [7] as was observed in the present study.

Conclusion :

Thus amalgam showed a better retention property in comparison with ketac molar in both the techniques Hence chemomechanical technique though time consuming was found to be more comfortable and is definitely superior compared to conventional technique in pediatric dentistry ,provided we use a lesser technique sensitive restoration which retains in the oral cavity for longer period of time.

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