



Evaluation of the Place of Chemo-Mechanical Caries Removal Method in Dental Education among Turkish Students

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Academic Editors: Alessandro Leite Cavalcanti and Wilton Wilney Nascimento Padilha

Received: 01 December 2017 / Accepted: 07 February 2018 / Published: 12 February 2018

Abstract

Objective: To evaluate the place of chemo-mechanical caries removal (CMCR) methods within the scope of undergraduate education of two different dental faculties which located in close geography but with different socio-economic characteristics. **Material and Methods:** In this cross-sectional, descriptive study totally 130 participants (Ankara: n = 78 and Kırıkkale: n = 52) were evaluated. A survey which consisting of 14 questions were conducted by face to face. Data was analyzed using the SPSS software. Frequency distributions and the Chi-Square test were applied. **Results:** 66.9% of the participants reported that they had knowledge about the chemomechanical caries removal method. 60% had knowledge about the mechanism of CMCR. Thirty-six point two percent of the participants from Ankara stated that they had knowledge about the CMCR mechanism and 40% did not know about any of the methods of CMCR. 52.8% of the respondents indicated that they should be minimally invasive in choosing the CMCR method. The most important reason for not choosing the CMCR method was inadequate method (32%) and takes too much time (32%). **Conclusion:** Significant differences were found between the students of the two cities regarding the awareness of the CMCR method. In order to overcome this disparity, the curriculum place of the CMCR method needs to be determined precisely and clearly.

Keywords: Education, Dental; Dental Caries; Students, Dental.

Introduction

In order to ensure the success and longlasting of tooth filling restorations, decayed infected dental tissue must be removed and the cavity must be properly sealed. For a while, with the influence of the minimal invasive concept it is suggested to remove only the infected tissue and to protect the affected (remineralizable) tissue during restorations [1]. With the most commonly used traditional method, preparations made with diamond, tungsten carbide or steel drills used with aerators and micromotors [2]. Although it is easy to remove the decayed tissue by using burs, the mechanical force exerted directly on the tooth causes the fluid in the dentine tubules to move inward and thus to cause pain [2].

In addition during the preparation of the cavity by conventional method, negative factors such as heat pressure and vibration due to friction between the teeth and the bur may occur and that may reach to the pulp through dentine, even one of these factors may cause pulp irritation [3]. It has been also reported that over excavation during conventional preparation reduces the potential of pulp to produce the repaired dentin [4]. Chemo-mechanical method is one of the alternative caries removing methods, which involves the chemical softening of carious dentin followed by its removal with gentle excavation. There are two types of products as: 1) Sodium Hypochlorite Based Agents of Caridex and Carisolv and 2) Enzyme Based Agents of Papacarie and Biosolv.

Clinical and laboratory investigations of Caridex the first chemomechanical caries removal system approved by the US Food and Drug Administration (FDA) show that the method is not very effective in caries removal. The search for new products has continued because of the problems such as expensive, shorter shelf life and the need for too much solution in use. The shortcomings of the Caridex system were addressed in the development of Carisolv.

Carisolv®, which was marketed in Sweden in 1998 as an alternative chemomechanical caries removal procedure to Caridex, has been marketed as an improved version of the caries removal system [5,6]. Carisolv consists of a colorless liquid containing three different amino acids (glutamic acid, leucine and lysine) and a gel containing carboxymethylcellulose, sodium chloride and sodium hydroxide in addition to these amino acids and 0.5% sodium hypochlorite. Carboxymethylcellulose, increases the viscosity and helps the material to be in a gel consistency, thus helping to improve adhesion with the caries lesion. Sodium hypochlorite is a proteolytic agent capable of removing organic components. Depending on the strong chemical effect, hypochlorite may also break down non-necrotic tissues, but hypochlorite amino acids may be added to form mono-di chloramines with high pH, and chloramines on this side may reduce hypochlorite side effects, leading to particularly denatured proteins and collagen [7].

Papacarie® is a newly manufactured method for chemomechanical caries removal method. This product's active ingredients such as papain and chloramine, have bactericidal, bacteriostatic and antiinflammatory properties [8]. Papain acts as a debris-removing agent, with no harmful effect on sound tissues. It acts only on infected tissues, which lack the α 1-antitripsine plasmatic antiprotease that inhibits proteolysis in healthy tissues [9]. For this reason, Papacarie allows the removal of

caries dentin, leading to minimal damage to healthy dentin [10]. Biosolv (SFC-V and SFC-VIII, 3M-ESPE AG, Seefeld, Germany) is an enzymatic chemomechanical caries removal agent that is still experimental. The information about Biosolv is limited to what the producer company reports [11-13].

Chemo-mechanical caries removing ensures the selective removal of degraded collagen fibrils in carious dentin lesion while preserving the affected demineralized dentin layer [14]. It's also reported that agents used in this technique have anti-inflammatory effects and these agents are have biocompatible and non-toxic properties [15]. Besides of these histological advantages chemo-mechanical caries removal method is easily accepted by the patients because of the features such as no noise, no vibration and no pain and therefore no need to local anesthesia in most cases [16].

Studies have shown that patients who are treated with the chemo-mechanical method may be able to do treatment without the need for anesthesia and although the time spent is long the method is preferred by the patients [17]. Especially in the cases like the patients who have been forced to cooperate because of excessive fear or mental retardation and in pediatric patients this method may be the only alternative. To apply effectively, the clinician should have more technical knowledge and should give more clinical effort regarding chemo-mechanical method [18].

In this context, although this kind of methods or technics can be learned through further trainings or courses, it cannot be underestimated that it will be very valuable to learn these subjects in undergraduate education. A recent study in India has shown that the vast majority of dental practitioners never apply these methods and even a large part of them have no knowledge even theoretically [19]. In another study, which was made in USA and Canada, it is also determined that the majority of dentists graduating from dental schools in US and Canada were unaware about CMCR products [20].

Since it has been found that there are very few studies on this subject and even that it is not done in our country at all the purpose of this study was to evaluate the knowledge level about the chemo-mechanical caries removal methods of practioners who educated/continuing education in two different dental faculties which located in close geography but with different socio-economic characteristics in Kırıkkale and Ankara, Turkey.

Material and Methods

Study Location

Ankara is the second largest city of Turkey and is located in the northwestern part of the country. Kırıkkale is the capital of the Kırıkkale Province in the Central Anatolia region of Turkey. The population of the province is 280,834, of which 192,705 live in the city of Kırıkkale.

Data Collection

A total of 160 questionnaires were distributed, being 100 in Ankara and 60 in Kırıkkale. A survey which consisting of 14 questions were conducted by face to face. The questionnaire were

given on a day and collected the next day. Demographic information (gender and age) and the knowledge about the method of chemo-mechanical caries removal and alternative caries cleaning methods were obtained.

Data Analysis

Data was analyzed using the Statistical Package for Social Sciences (SPSS Chicago, Illinois, USA). Frequency distributions were carried out for all variables. The Chi-Square test was applied to assess the significance of differences between groups at a p-value of 0.05.

Ethical Aspects

Approval of the study was obtained from the Kırıkkale University Clinical Research Ethics Committee (Reg. No: 16/08-20.06.2017). This cross-sectional, descriptive study was carried out by the researchers of the Faculty of Dentistry, Kırıkkale University, Turkey.

Results

The numerical results obtained as a result of this research were shown in Table 1. Of the 130 (81.3%) people who participated in the study, 40% were from Kırıkkale and 60% from Ankara. Of these 130 people, 70% were female. Of the 78 people who surveyed from Ankara, 79.6% were female while in Kırıkkale 59.6% were female. The highest number of participants from both countries was 23 years old (42.3%). 89.2% of the individuals participating in the survey were still continues their educations.

Table 1. Distributions of the participants according to demographic variables and knowledge.

Variables	Ankara		Kırıkkale		Total		p-value
	n	%	n	%	n	%	
Gender							
Male	18	23.1	21	40.4	39	30.0	0.035*
Female	60	79.6	31	59.6	91	70.0	
Age							
21	3	3.8	5	9.6	8	6.2	0.503
22	22	28.2	16	30.8	38	29.2	
23	35	44.9	20	38.5	55	42.3	
24	17	21.8	10	19.2	27	20.9	
25	1	1.3	0	0.0	1	0.8	
27	0	0.0	1	1.9	1	0.8	
Educational Status							
Continuing education	64	82.1	52	100.0	116	89.2	0.005*
1 year	12	15.4	0	0.0	12	9.2	
2 years or more	2	2.5	0	0.0	2	1.6	
Knowledge about the method of chemo-mechanical caries removal							
Yes	36	46.2	51	98.1	87	66.9	0.001*
No	42	53.8	1	1.9	43	33.1	
You have information about which alternative caries cleaning methods are available							
Air-abrasion	4	5.2	1	1.9	5	3.8	0.373
Sono-abrasion	2	2.5	4	7.7	6	4.7	

CMCR	0	0.0	0	0.0	0	0.0	
Laser ablation method	5	6.4	5	9.6	10	7.7	
ART (Atraumatic Restorative Treatment)	67	85.9	42	80.8	109	83.8	
You have more information about which of the CMCR products							
Caridex	9	11.5	26	50.0	35	26.9	0.001*
Carisolv	22	28.2	17	32.7	39	30.0	
Papacarie	0	0.0	4	7.7	4	3.1	
Biosolv	0	0.0	0	0.0	0	0.0	
None	47	60.3	5	9.6	52	40.0	
Information on the mechanism of chemo-mechanical caries removal							
Yes	28	36.2	50	96.2	78	60.0	0.001*
No	50	63.8	2	3.8	52	40.0	
Using the CMCR method							
Yes	1	3.2	1	2.1	2	2.8	0.764
No	30	96.8	46	97.9	76	97.2	
The most preferred							
Carisolv	1	100.0	1	100.0	2	100.0	
The reason for choosing the CMCR system							
Convenience for disabled patients	6	24.0	3	6.4	9	12.5	0.057
Easy to control in difficult children	4	16.0	4	8.6	8	11.1	
Facilitate ease in anxious adult patients	2	8.0	5	10.6	7	9.7	
No need for anesthesia	5	20.0	5	10.6	10	13.9	
Minimally invasive	8	32.0	30	63.8	38	52.8	
The reason for not choosing the CMCR system							
Not having enough information	10	35.7	6	12.8	16	21.3	0.081
Taking too much time	7	25.0	17	36.2	24	32.0	
Expensive	2	7.2	9	19.1	11	14.7	
It's an inadequate method	9	32.1	15	31.9	24	32.0	
Thought about the qualification status of CMCR training in dentistry							
Yes	3	3.8	15	28.8	18	13.8	0.001*
No	75	96.2	37	71.2	112	86.2	
Request to participate in training course / seminar on CMCR							
Yes	64	82.1	34	65.4	98	75.4	0.031*
No	14	17.9	18	34.6	32	24.6	

Chi-square test; *Statistically significant.

Overall, 83.8% of the respondents reported that they had the most knowledge about atraumatic restorative treatment except traditional methods. In Ankara and Kırıkkale, it has been determined that the caries removal method, which is the most informative one, was the atraumatic restorative treatment (Table 1).

Sixty six point nine percent of the participants reported that they had knowledge about the chemomechanical caries removal method. 46.2% of the participants from Ankara stated that they had knowledge about the chemomechanical caries removal method, while 98.1% of the participants in Kırıkkale stated that they had knowledge about CMCR (Table 1).

Sixty percent of participants answered that they had knowledge about the mechanism of CMCR. Thirty-six point two percent of the participants from Ankara stated that they had knowledge about the CMCR mechanism, while in Kırıkkale the percentage of respondents was 96.2% (Table 1).

Forty percent of respondents said that they did not know about any of the methods of CMCR, while 30% stated about Carisolv. 60.3% of the participants in Ankara stated that there was no information about any of the methods of CMCR. Of the participants in Kırıkkale, 9.6% stated that they had no information about any of the methods of CMCR. A significant difference was found between the two cities in this respect ($p < 0.05$).

Only 2.8% of the subjects stated they used the CMCR method before. 52.8% of the respondents indicated that they should be minimally invasive in choosing the CMCR method. The most important reason for not choosing the CMCR method was inadequate method (32%) and take too much time (32%). In Ankara, 35.7% answered that they did not have sufficient information about the method, while in the province of Kırıkkale, 36.2% of the respondents said that they took more time.

Only 13.8% of participants said that CMCR methods were adequately explained during dental education. 75.4% of participants reported that they wanted to attend a training course/seminar about CMCR after graduation.

Discussion

The purpose of this study was to investigate whether there was any difference in the level of knowledge and education about the chemomechanical caries removal method among the dentists or newly graduated dentists trained in Ankara city which is more metropolitan and the Kırıkkale city. The majority of participants were still in training. The participants with 23 years of age had the biggest contribution with 42.3%. In addition, the most majority of participants were women.

There was a significant difference between the participants in the two cities regarding qualification ($p < 0.05$), and participants in Ankara were found to be more willing to post-graduate training. The main point of interest in this study is that the most majority of practitioners participating the study were eager to learn these methods through courses. From this point, it can be argued that it may be necessary to give more time to teach these methods at the level of undergraduate education

In a study conducted in the USA and Canada, it was reported that the dentistry curriculum does not cover CMCR products, and in the USA and Canada dental medicine graduates reported that they did not have enough knowledge about CMCR products [20]. In Turkey, CMCR method and products are in the scope of dentistry curriculum and 13.8% of the respondents who participated in our survey reported that the CMCR method was handled adequately during their education. However, this study, made in 1989, is not very suitable compared to our work because it was made 27 years ago, as well as the advances in alternative caries removal methods and the increased interest in this area.

Regarding the CMCR method, a significant difference was found between two cities and it was thought that this difference was caused by the difference in the level of education in the CMCR method ($p < 0.05$). In a study conducted in India, 46.7% of the dentists in Pune answered that they

had knowledge about the method, while in Mumbai, only 13.3% [19]. The high rate of our participants' knowledge of the CMCR method in this study suggests that our population was younger and that their knowledge may be fresher.

Regarding the knowledge of the mechanism of the CMCR method, a significant difference was found between the students ($p < 0.05$). It is thought that this difference may be due to differences in the level of detailing of the subject at the level of education at the undergraduate level and the number of hours of classroom instruction for the description of the subject.

In India, 14.3% of the participants in Pune city reported that have knowledge about Caridex, 57.1% of about Carisolv and 28.6% of them have knowledge about Papacarie. In Mumbai city, 25% of the participants have information about Caridex, 75% of them about Carisolv, and none of the participants in this city have any information about the Papacarie method [19]. In present study, 60.3% of the participants in Ankara stated that they had no information about CMCR systems, and only 28.2% stated that had knowledge about Carisolv and 11.5% of them had knowledge about Caridex system. None of the participants in Ankara have any information about the Papacarie method. In Kırıkkale, only 9.6% of the participants stated that they had no information about the method of CMCR, 50% stated that have information about Caridex, 32.7% about Carisolv and 7.7% had information about Papacarie. There was a significant difference between the students of dental faculties ($p < 0.05$). The ignorance of the new systems has led to the need to follow current studies and transfer these developments to curriculum content. At this point, it is necessary to standardize the course divided into the curriculum and the course content should be put into a certain level.

Participants in present study indicated that they preferred the CMCR method because it has the minimally invasiveness potential. There was no significant difference between the undergraduate students of dental faculties ($p > 0.05$).

The lack of sufficient studies on this issue reduces the possibility of a healthy comparison due to the geographical and economic differences between the countries in which the existing studies are conducted. This suggests that this need to be emphasized and that more extensive research with more people is needed.

Conclusion

Significant differences were found between the students of the two cities regarding the awareness of the CMCR method. In order to overcome this disparity, the curriculum place of the CMCR method needs to be determined precisely and clearly. For this purpose, it is necessary to standardize the subjects such as how many hours of chemomechanical caries removal method will be discussed in total and what topics will be mentioned in this course. There is a need for further research with more participants on whether education is sufficient in this regard. Through these researches, deficiencies in the education system should be identified and necessary arrangements made.

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