

THE ASSESSMENT OF KARIKLINZ SYSTEM ON CHEMO-MECHANICAL REMOVAL OF CARIOUS DENTINE AND RESIDUAL BACTERIA

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ABSTRACT

The aim of study: The aim of this study is to assess the capacity of chemo-mechanical system KariKlinz to remove carious cervical and root dental tissues and effect on cariogenic bacteria comparing with classical mechanical method. **Materials and method:** The cervical and root carious lesions (n =28) (active, vital teeth) were randomly distributed to one of the next carious dentine removal methods: (Study group I) chemo-mechanical method Kariklinz Vladmiva (n = 14), (Study group II) classical mechanical method using conventional speed and spherical bur (n = 14). The assessment was performed using laserfluorescence method DIAGNOdent® (Kavo, Biberach, Germania) before and after preparation and microbial test (Replica Test) used for detection of Mutans Streptococcus localised on the surface of prepared cavities. **Results:** Both methods have similar results regarding the ability to reduce carious flora level after carious dentine removal; the percentages of residual bacteria are 2,78% for chemo-mechanical method and 2,85% for classical mechanical method. The reading of DIAGNOdent were significantly lower after cavities preparation (9,07 for chemo-mechanical method and 8,85 for classical mechanical method). **Conclusions:** Both excavation methods investigated in this study demonstrated similar efficiency in carious dentine removal, accordingly to results of DIAGNOdent® method and microbial test (Replica Test).

Keywords: chemo-mechanical method, root dental caries, Replica test, laserfluorescence

INTRODUCTION

Despite technological progresses and scientific researches, root dental caries represent a controversial issue regarding evolution and preventive-therapeutical methods (1,2). Due to morphological and structural particularities of cement and root dentine, these lesions represent a challenge for therapeutical success (3,4). Despite the fact that dental amalgam was considered for many years the only viable restorative

solution, actually the options are more diverse and efficient (5). The early diagnosis of incipient forms, the application of preventive means, use of remineralisation agents (Ca, P, F), ozone, laser systems, air-abrasion, Caridex, Carisolv, Kariklinz, as well as the use of adhesive materials (compomers, resin-modified glassionomer cements, traditional glassionomer cements, giomers) combined with principles of minimal invasive therapy, allow success on long term (6,7,8).

The use of chemo-mechanical method has significant advantages as follows: low sensitivity, lack of anaesthesia, less traumatizing, lack of vibration and noise (7,8,9). Many researchers and producers try to find viable and less aggressive methods to remove carious dentine and to avoid pulp damages as well as change of dental tissues (9-15).

The excavation of altered dental tissues is, in fact, the removal of soft and infected dentine to maintain only hard dentine layer. Chemo-mechanical method Kariklinz can be a viable solution. The combination between Kariklinz method and detection by laserfluorescence method (DIAGNOdent®) represent an efficient method with good therapeutical results (16).

The residual cariogenic bacteria remains a controversial issue. These bacteria represent principal factor associated to recurrent and adjacent dental caries that will provoke restoration failure.

To obtain success on long term is requested an antibacterial approach. NaOCl can be used as efficient agent against cariogenic bacteria (17-19). Most used method is differentiation between affected and infected dentine layers (15,20). A new method that assesses an impression with cariogenic bacteria on the carious dentine surfaces was proposed by Rosenberg et al. (21). An impression of carious cavity with a material that contains sucrose (chewing gum) is incubated in selective media for cariogenic bacteria.

AIM OF THE STUDY

The aim of this study is to assess the capacity of chemo-mechanical system KariKlinz to remove carious cervical and root dental tissues and effect on cariogenic bacteria comparing with classical mechanical method.

MATERIAL AND METHODS

This study was performed according to norms approved by Ethics and Research Commission of Dental Medicine Faculty, U.M.F. “Grigore T. Popa” Iasi. Study group included 12 patients (age 45-70 years) with medium cariogenic risk, good oral hygiene, root dental caries. All patients benefited by professional cleaning before inclusion in study.

The cervical and root carious lesions (n =28) (active, vital teeth) were randomly distributed to one of the next carious dentine removal methods: (Study group I) chemo-mechanical method Kariklinz Vladmiva (n = 14), (Study group II) classical mechanical method using conventional speed and spherical bur (n = 14). The assessment were performed using laserfluorescence method DIAGNOdent® (Kavo, Biberach, Germania) before and after preparation and microbial test (Replica Test) used for detection of Mutans Streptococcus localised on the surface of prepared cavities

Kariklinz system is presented in Figure 1. Gel no.1 contains antiseptic agent aimed to dissolve mineral components of carious dentine.



Figure 1. Syringe with Carisolv
Gel no.2 contains NaOCl aimed to dissolve the exposed collagen fibers (organic component).



Figures 2-6. Chemo-mechanical excavation with Kariklinz.



Figures 7-10. Clinical aspects of carious surfaces treated by classical mechanical excavation (bur)



Figures 11- 14. Clinical aspects and Diagnodent recordings of carious surfaces in samples treated by classical mechanical excavation.

Recordings with DIAGNOdent® (Kavo, Biberach, Germany) and microbial test (Replica Test) were performed before and after preparation.

Method Replica Test was performed using a chewing gum (West, ION) applied on carious surface with root dental caries. The

impression of sample tooth is used for further bacteria growth (Rosenberg M, 1988). The impression is immersed in a selective media for streptococcus mutans and incubated to 37°C for 24 hours. The bacterial colonies were highlighted by their dark blue coloration (figures 15-16).



Figure 15 a). miniimpression before incubation b). microbial colonies before removal of root carious tissues c). microbial colonies after îndepărtarea țesutului radicular cariat.

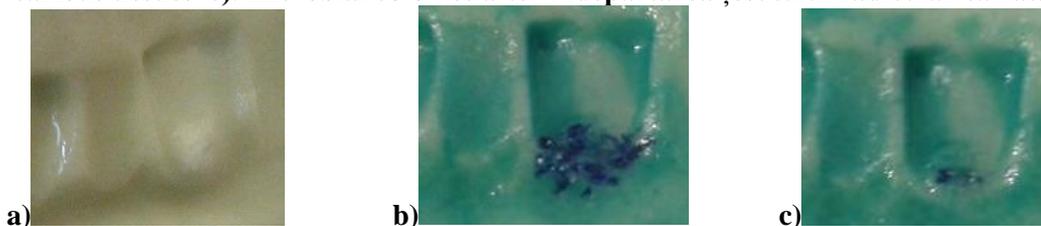


Figure 16 a). miniimpression before incubation, b). microbial colonies before removal of carious root tissues, c). microbial colonies after removal of carious root tissues

After 24 hours of incubation, the impressions were photographed with Canon D-SLR EOS 600D (Full HD). The growth of cariogenic bacteria was assessed by quantification of blue colour using a software for digital image analysis (Image J, NIH). Also the assessment of carious tissues was performed with DIAGNOdent® (Kavo,

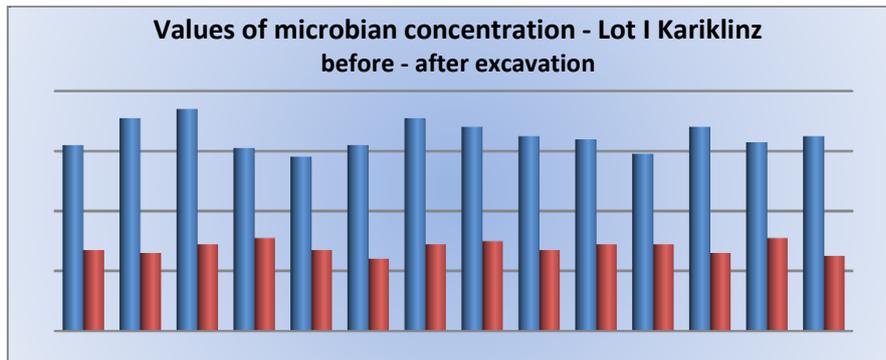
Biberach, Germany).

RESULTS AND DISCUSSIONS

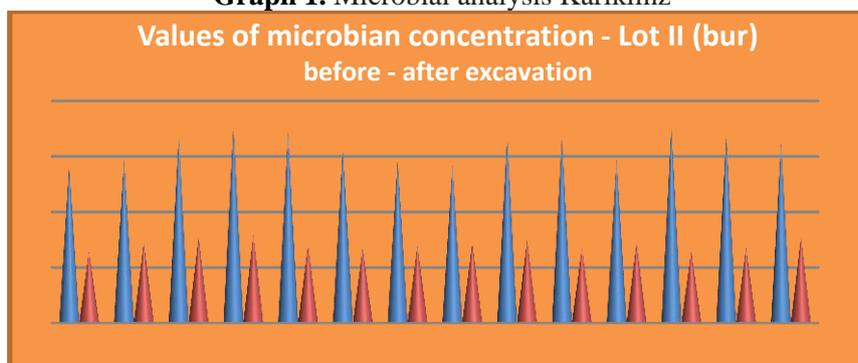
Mean values and standard deviations of investigated parameters were compared using test ANOVA. P <0,05 was considered statistically significant. The results are presented in following tables and figures.

Table 1. Bacterial levels before and after carious dentine removal for study groups.

Nr.	STUDY GROUP I (Kariklinz)		STUDY GROUP II(bur)	
	Before excavation	After excavation	Before excavation	After excavation
1	6,2	2,7	5,7	2,6
2	7,1	2,6	5,9	2,9
3	7,4	2,9	6,7	3,1
4	6,1	3,1	7,1	3,2
5	5,8	2,7	6,9	2,8
6	6,2	2,4	6,3	2,7
7	7,1	2,9	5,9	2,8
8	6,8	3,0	5,7	2,9
9	6,5	2,7	6,7	3,0
10	6,4	2,9	6,7	2,7
11	5,9	2,9	5,9	2,9
12	6,8	2,6	7,1	2,6
13	6,3	3,1	6,8	2,7
14	6,5	2,5	6,5	3,1
Mean values	6,50	2,78	6,42	2,85



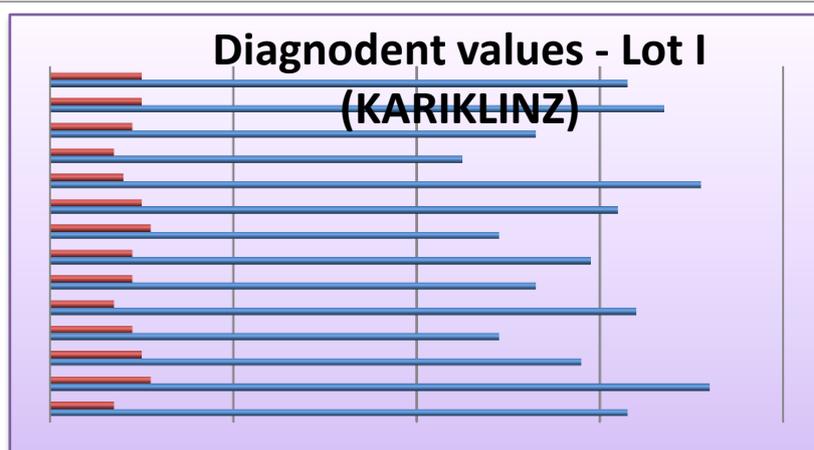
Graph 1. Microbial analysis Kariklinz



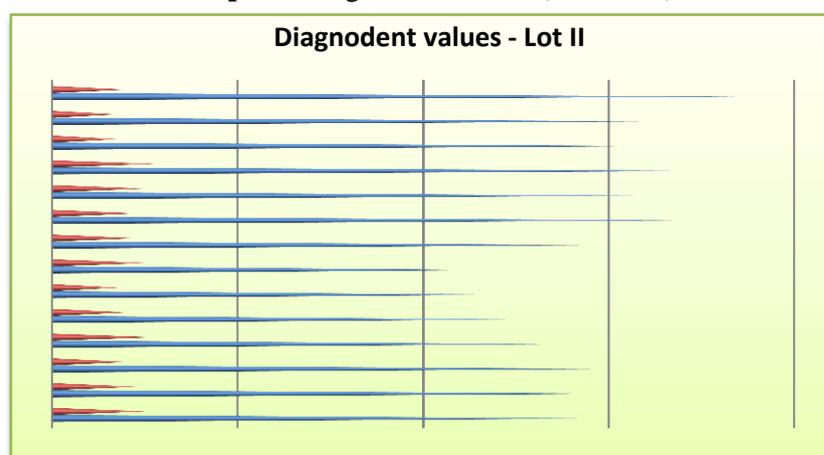
Graph 2. Microbial analysis (bur)

Table 2. Diagnodent values before and after carious dentine removal for the investigated study groups

Nr.	STUDY GROUP (Kariklinz)		STUDY GROUP(bur)	
	Before excavation	After excavation	Before excavation	After excavation
1	63	07	59	10
2	72	11	62	09
3	58	10	61	08
4	49	09	53	11
5	64	07	49	08
6	53	09	48	07
7	59	09	47	10
8	49	11	59	09
9	62	10	67	09
10	71	08	63	10
11	45	07	71	11
12	53	09	66	07
13	67	10	65	07
14	63	10	74	08
Mean values	59,14	9,07	60,28	8,85



Graph 4. Diagnodent values (Kariklinz)



Graph 5. Diagnodent values (bur)

No significant statistical differences were recorded between the investigated methods

before and after treatment, for microbial analysis (ANOVA, $p = 0,42$, $p = 0,68$) and for

Diagnodent (ANOVA, $p = 0,42$, $p = 0,27$). Both methods have similar results regarding the ability to reduce carious flora level after carious dentine removal; the percentages of residual bacteria are 2,78% for chemo-mechanical method and 2,85% for classical mechanical method. The reading of DIAGNOdent were significantly lower after cavities preparation (9,07 for chemo-mechanical method and 8,85 for classical mechanical method).



Figures 17-20. Diagnodent values for study groups: before and after carious tissues removal

These results agree with other studies using microbial researches on dentine

samples (22-25). The microbial analysis (Replica test) is a simple method, easy to be used in private dental offices.

For Replica Test it is not requested the collecting of healthy dental tissue after cavity preparatin. More, Replica Test avoid the problems related to variations of dentine samples volume (26-30). Criteria regarding complete removal of carious dentine are subjective, depending on the experience and ability of dentist. These criteria were confirmed by objective readings using DIAGNOdent®. According to DIAGNOdent® readings carious dentine was absent in all cavities prepared by the investigated excavation methods.

CONCLUSIONS

Chemo-mechanical method and classical mechanical method, investigated in this study, demonstrated similar efficiency in carious dentine removal, accordingly to results of DIAGNOdent® method and microbial test (Replica Test). Replica Test is useful to obtain additional informations, regarding topographical distribution of residual cariogenic bacteria.

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