International Poster Journal IPJ of Dentistry and Oral Medicine

Int Poster J Dent Oral Med 2004, Vol 6 No 01, Poster 214

Effect of a Chlorhexidine Solution on Resin Hybridization with Dentin

Language: English

Authors:
PD Dr. Christof Dörfer, Dr. Christine Haus, Diana Wolff, Prof. Dr. Dr. Hans Jörg Staehle, PD Dr. Thomas Pioch
Poliklinik für Zahnerhaltungskunde, Universitätsklinikum Heidelberg

Date/Event/Venue:
September 25-28th, 2002
Jahrestagung der CED
Cardiff/Great Britain

Introduction

Due to the microbial pathogenesis of caries and the penetration of bacteria into dentinal tubules the disinfection of cavities with chlorhexidine was recommended.

Objectives

The purpose of this study was to investigate the effect of dentinal disinfection with a 0.1% chlorhexidine-dicluconate solution (CHX; Chlorhexamed; ProcterGamble®) on the hybridization of three dentin bonding agents with dentin and enamel. We used a water-based primer (AquaPrime®), an acetone based one-bottle-system (Prime&Bond NT®) and an alcohol based primer (OptiBond®).

Material and Methods

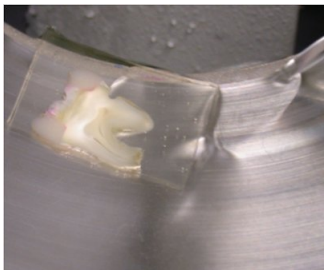
Teeth

Twenty one non-carious extracted human molars were randomly divided into three parts according to the restoration material used. The study design was a split-tooth double blind controlled in-vitro examination. Two Class-II-restorations on the mesial and distal aspect of every tooth were performed. One cavity was selected to be washed with CHX (test group) according to a randomization list. The correspondent cavity was not washed with CHX (control group). Restorations were carried out with the following bonding systems:

Bonding Systems

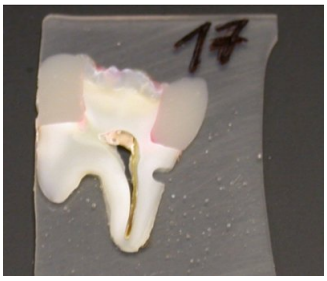
Group I: Resulcin® AquaPrime + MonoBond + Revolcin® Fil (Merz Dental)
Group II: DeTrey Conditioner 36 + Prime&Bond NT + EsthetX® (Dentsply)
Group III: Email preparator (Ivoclar Vivadent) + OptiBond FL (Kerr) + XRV Herculite (Kerr)
All materials were labeled with a fluorescent dye and used following the instructions for use.

Course of the study



Restorations were carried out using an incremental technique with polymerizing each increment for 20 s (Elipar II). After refining and polishing the restoration, the teeth were sectioned into halves in mesio-distal direction and parallel to the long axis of the tooth. One half was prepared for scanning electron microscopy, the second half was used for confocal laser scanning microscopy.

Evaluation



We examined the quality of the hybrid layer, using the parameters "length of resin tags", "thickness of the hybrid layer" and presence of cracks within the hybrid layer and/or in between the hybrid layer and either dentin or enamel. Detailed pictures of the interdiffusion zone or hybrid layer were assembled by using two different microscopic techniques:
1. Scanning electron microscopy (SEM, Amray 1810D)
2. Confocal laser scanning microscopy (CLSM, Leica TCS)

Statistical Analysis

Differences between test and control were analysed by means of the non-parametric Wilcoxon test for paired samples or in case of binary variables with the Chi square-test. The significance level was set at $p = 0.05$.

Results

Hybrid layers and tags were found in every group. For all materials used, the thickness of the hybrid layers (CLSM) was 4.7 ± 1.1 µm in the control group and 4.2 ± 1.0 µm in the test group ($p = 0.022$). Tag lengths (SEM) were found to be 43.6 ± 31.1 µm in the control group and 65.3 ± 57.2 µm in the test group ($p = 0.036$). Analyzing each material a statistical trend was seen with the alcohol based primer, only
(Table 1).

		SEM			**CLSM**		
		with disinf.	**without disinf.**	**p-value**	**with disinf.**	**without disinf.**	**p-value**
Aqua Prime	**hybrid layer thickness**	3.46 ± 2.08	4.81 ± 0.91	0.149 (ns)	4.86 ± 0.46	5.10 ± 0.95	0.893 (ns)
	tag length	20.00 ± 19.79	15.71 ± 17.90	0.510 (ns)			
Prime&Bond	**hybrid layer thickness**	4.75 ± 1.41	4.24 ± 0.86	0.116 (ns)	3.73 ± 0.87	4.20 ± 1.00	0.128 (ns)
	tag length	60.00 ± 30.28	48.75 ± 24.96	0.434 (ns)			
Optibond	**hybrid layer thickness**	3.85 ± 1.22	4.79 ± 1.66	0.189 (ns)	4.08 ± 1.15	5.01 ± 1.18	0.063 (ns)
	tag length	113.57 ± 57.28	68.57 ± 21.16	0.064 (ns)			
total	**hybrid layer thickness**	4.21 ± 1.51	4.55 ± 1.21	0.622 (ns)	4.16 ± 0.97	4.74 ± 1.08	0.022
	tag length	65.28 ± 57.18	43.61 ± 31.05	0.036			

Table 1: Hybrid layer thickness and tag lengths with and without disinfection. Mean values ± standard deviations (SD) and p-values are listed.

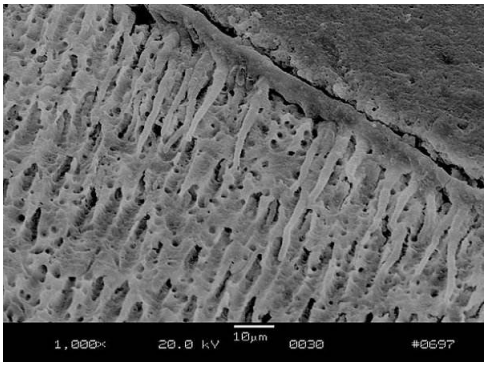


Fig. 4a SEM: Aqua Prime with CHX-disinfection

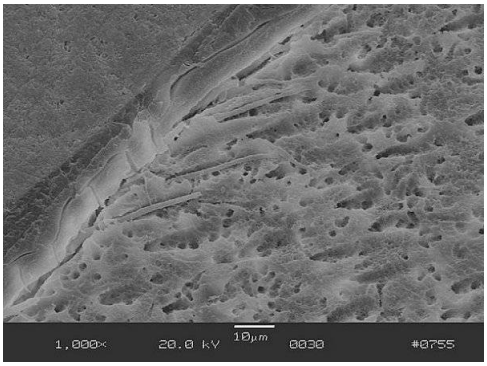


Fig. 4b SEM: Aqua Prime without CHX-disinfection

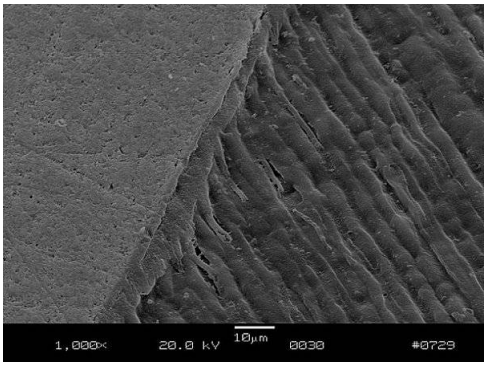


Fig. 5a SEM: Prime&Bond NT with CHX-disinfection

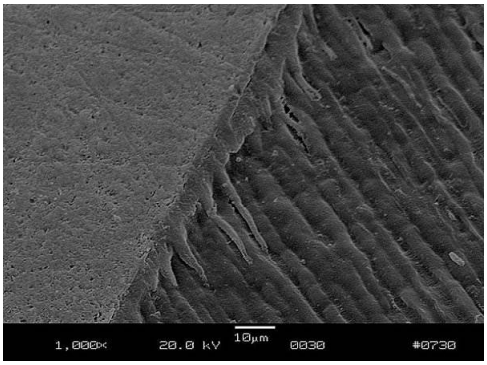


Fig. 5b SEM: Prime&Bond NT without CHX-disinfection

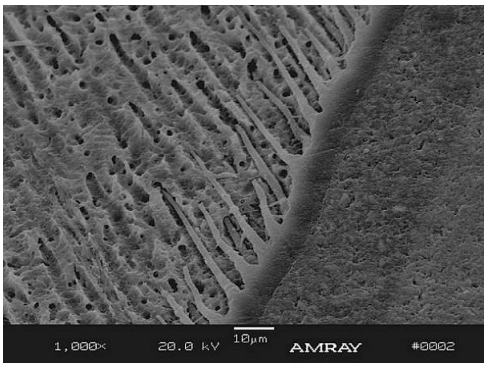


Fig. 6a SEM: OptiBond FL with CHX-disinfection

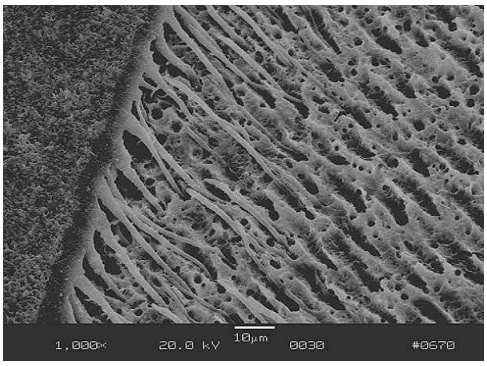


Fig. 6b SEM: OptiBond FL without CHX-disinfection

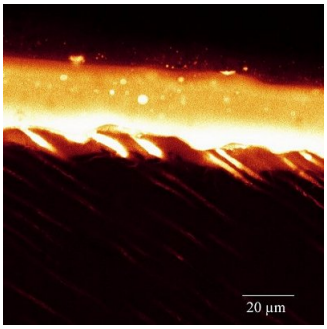


Fig. 7a CLSM: Aqua Prime with CHX-disinfection

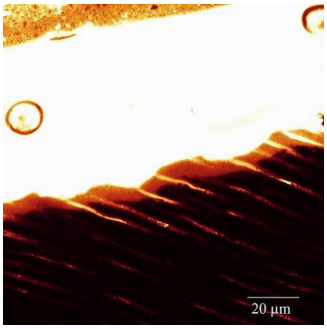


Fig. 7b CLSM: Aqua Prime without CHX-disinfection

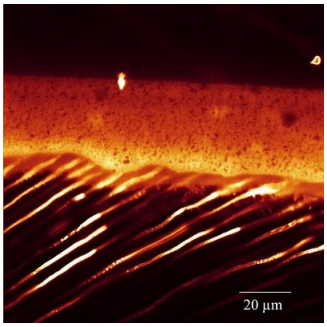


Fig. 8a CLSM: Prime&Bond NT with CHX-disinfection

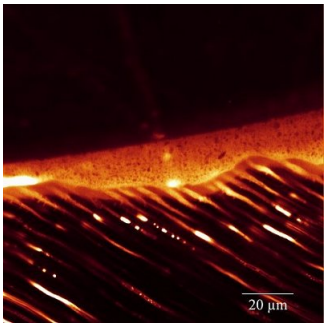


Fig. 8b CLSM: Prime&Bond NT without CHX-disinfection

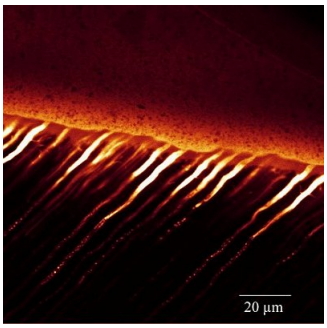


Fig. 9a CLSM: OptiBond FL with CHX-disinfection

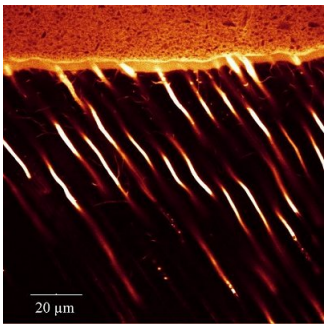


Fig. 9b CLSM: OptiBond FL without CHX-disinfection

Discussion and Conclusions

It is concluded that using chlorhexidine before acid etching might effect the hybridisation of bonding resins with dentin, significantly. However, analysing each material seperately, the differences failed to be statistically significant and only trends were found.

This Poster was submitted by PD Dr. Christof Dörfer.

Correspondence address:
PD Dr. Christof Dörfer
Poliklinik für Zahnerhaltungskunde
Im Neuenheimer Feld 400
69120 Heidelberg
Germany

Poster Faksimile:

394 Effect of a Chlorhexidine Solution on Resin Hybridization with Dentin

C. HAUS, D. WOLFF, H.J. STAEHLE, T. PIOCH, C.E. DÖRFER*

University of Heidelberg, Dept. of Conservative Dentistry, Im Neuenheimer Feld 400, 69120 Heidelberg, Germany

Introduction

The purpose of this study was to investigate the effect of dentinal disinfection with a 0.1% chlorhexidine-dicluconate solution (CHX; Chlorhexamed; ProcterGamble®) on the hybridization of three dentin bonding agents with dentin and enamel. We used a water-based primer (AquaPrime®), an acetone based one-bottle-system (Prime&Bond NT®) and an alcohol based primer (OptiBond®).

Materials and Methods

Teeth

Twenty one non-carious extracted human molars were randomly divided into three parts according to the restoration material used. The study design was a split-tooth double blind controlled in-vitro examination. Two Class-II-restorations on the mesial and distal aspect of every tooth were performed. One cavity was selected to be washed with CHX (test group) according to a randomization list. The correspondent cavity was not washed with CHX (control group). Restorations were carried out with the following bonding systems:

Bonding Systems

Group I: Resulcin® AquaPrime + MonoBond + Revolcin® Fil (Merz Dental)
Group II: DeTrey Conditioner 36 + Prime&Bond NT + Ersthetic X® (Dentsply)
Group III: Email preparator (Ivoclar Vivadent) + OptiBond FL (Kerr) + XRV Herculite (Kerr)
All materials were labeled with a fluorescent dye and used following the instructions for use.

Course of the study

Restorations were carried out using an incremental technique with polymerizing each increment for 20 s (Elipar II). After refining and polishing the restoration, the teeth were sectioned into halves in mesio-distal direction and parallel to the long axis of the tooth. One half was prepared for scanning electron microscopy, the second half was used for confocal laser scanning microscopy.

Evaluation

We examined the quality of the hybrid layer, using the parameters "length of resin tags", "thickness of the hybrid layer" and "presence of cracks within the hybrid layer and/or in between the hybrid layer and either dentin or enamel. Detailed pictures of the interdiffusion zone or hybrid layer were assembled by using two different microscopic techniques:

1. Scanning electron microscopy (SEM, Amray 1810D)
2. Confocal laser scanning microscopy (CLSM, Leica TCS)

Statistical Analysis

Differences between test and control were analysed by means of the non-parametric Wilcoxon test for paired samples or in case of binary variables with the Chi square-test. The significance level was set at p = 0.05.

Results

Hybrid layers and tags were found in every group. For all materials used, the thickness of the hybrid layers (CLSM) was 4.7 ± 1.1 µm in the control group and 4.2 ± 1.0 µm in the test group (p = 0.022). Tag lengths (SEM) were found to be 43.6 ± 31.1 µm in the control group and 65.3 ± 57.2 µm in the test group (p = 0.036). Analyzing each material a statistical trend was seen with the alcohol based primer, only (Table 1).

Table 1 Hybrid layer thickness and tag lengths with and without disinfection. Mean values ± standard deviations(SD) and p-values are listed.

		SEM			CLSM		
		with disinf.	without disinf.	p-value	with disinf.	without disinf.	p-value
Aqua Prime	hybrid layer thickness	3.46 ± 2.06	4.81 ± 0.91	0.149 (ns)	4.86 ± 0.46	5.10 ± 0.95	0.893 (ns)
	tag length	20.00 ± 19.79	15.71 ± 17.90	0.510 (ns)			
Prime&Bond	hybrid layer thickness	4.75 ± 1.41	4.24 ± 0.86	0.116 (ns)	3.73 ± 0.87	4.20 ± 1.00	0.128 (ns)
	tag length	60.00 ± 30.28	48.75 ± 24.95	0.434 (ns)			
Optibond	hybrid layer thickness	3.85 ± 1.22	4.79 ± 1.66	0.189 (ns)	4.08 ± 1.15	5.01 ± 1.18	0.063 (ns)
	tag length	113.57 ± 57.28	68.57 ± 21.16	0.064 (ns)			
total	hybrid layer thickness	4.21 ±1.51	4.55 ± 1.21	0.622 (ns)	4.16 ± 0.97	4.74 ± 1.08	0.022
	tag length	65.28 ± 57.18	43.61 ± 31.05	0.036			

Fig. 4a SEM: Aqua Prime with CHX-disinfection

Fig. 4b SEM: Aqua Prime without CHX-disinfection

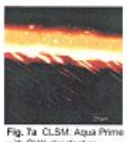


Fig. 7a CLSM: Aqua Prime with CHX-disinfection

Fig. 7b CLSM: Aqua Prime without CHX-disinfection

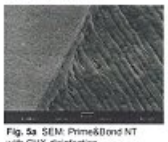


Fig. 5a SEM: Prime&Bond NT with CHX-disinfection

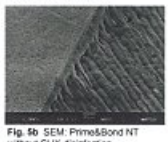


Fig. 5b SEM: Prime&Bond NT without CHX-disinfection

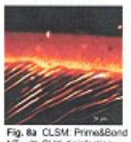


Fig. 8a CLSM: Prime&Bond NT with CHX-disinfection

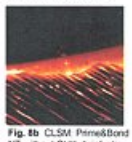


Fig. 8b CLSM: Prime&Bond NT without CHX-disinfection

Fig. 6a SEM: OptiBond FL with CHX-disinfection

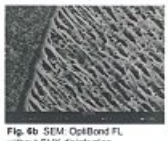


Fig. 6b SEM: OptiBond FL without CHX-disinfection

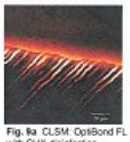


Fig. 9a CLSM: OptiBond FL with CHX-disinfection

Fig. 9b CLSM: OptiBond FL without CHX-disinfection

Conclusion

It is concluded that using chlorhexidine before acid etching might effect the hybridisation of bonding resins with dentin, significantly. However, analysing each material seperately, the differences failed to be statistically significant and only trends were found.

Correspondance to Priv.-Doz. Dr. Christof Dörfer
Im Neuenheimer Feld 400
D-69120 Heidelberg
e-mail: christof_doerfer@med.uni-heidelberg.de