UNIVERSIDADE FEDERAL DE SANTA MARIA
CENTRO DE CIÊNCIAS DA SAÚDE
PROGRAMA DE PÓS-GRADUAÇÃO EM CIÊNCIAS ODONTOLÓGICAS

EFEITO DO CONDICIONAMENTO ÁCIDO SELETIVO E DA CONDIÇÃO DO ESMALTE DECÍDUO NA UNIÃO DE UM SISTEMA ADESIVO UNIVERSAL

DISSERTAÇÃO DE MESTRADO

Bruna Feltrin Antoniazzi

Santa Maria, RS, Brasil

2015

EFEITO DO CONDICIONAMENTO ÁCIDO SELETIVO E DA CONDIÇÃO DO ESMALTE DECÍDUO NA UNIÃO DE UM SISTEMA ADESIVO UNIVERSAL

Bruna Feltrin Antoniazzi

Dissertação apresentada ao Curso de Mestrado do Programa de Pós-Graduação em Ciências Odontológicas, Área de Concentração em Odontologia, Ênfase em Odontopediatria, da Universidade Federal de Santa Maria (UFSM,RS), como requisito parcial para obtenção do grau de
Mestre em Ciências Odontológicas

Orientadora: Prof. Dra. Rachel de Oliveira Rocha

Santa Maria, RS, Brasil

2015

Universidade Federal de Santa Maria
Centro de Ciências da Saúde
Programa de Pós-Graduação em Ciências Odontológicas

A Comissão Examinadora, abaixo assinada,
aprova a Dissertação de Mestrado

EFEITO DO CONDICIONAMENTO ÁCIDO SELETIVO E DA CONDIÇÃO DO ESMALTE DECÍDUO NA UNIÃO DE UM SISTEMA ADESIVO UNIVERSAL

elaborada por
Bruna Feltrin Antoniazzi

como requisito parcial para obtenção do grau de
Mestre em Ciências Odontológicas

COMISSÃO EXAMINADORA:

Rachel de Oliveira Rocha, Dra.
(Presidente/Orientadora – UFSM)

Françoise Hélène van de Sande Leite, Dra. (IMED)

Thatiane Larissa Lenzi, Dra. (UFSM)

Santa Maria, 15 de Junho de 2015

DEDICATÓRIA

Dedico este trabalho à minha família, especialmente ao meu pai **Paulo**, que nunca mediu esforços para proporcionar a mim e ao meu irmão **Guilherme** a melhor educação, e que nos fez entender que nossa maior herança são os estudos. Igualmente, dedico à minha mãe **Ana**, alicerce da nossa família, a pessoa que nos une e nos enche de amor e alegria em todos os momentos.

AGRADECIMENTOS

À **coordenação e professores** do Programa de Pós-Graduação em Ciências Odontológicas da Universidade Federal de Santa Maria, que tanto se dedicam para a excelência do curso. Agradeço imensamente pelos ensinamentos e por fazer parte deste programa de Pós-Graduação.

Aos professores do curso de Odontologia da Universidade Federal de Santa Maria, que me ensinaram o ofício de cirurgiã-dentista e que sempre estiveram presentes na construção do conhecimento desta linda profissão. Em especial, aos professores da disciplina de Odontopediatria – **Ana Paula Mainardi, Leandro Berni Osorio, Thiago Ardenghi** - pela qual me apaixonei desde a primeira aula teórica. Gostaria de agradecer principalmente à professora e amiga **Marta Dutra de Oliveira**, que abriu as portas da disciplina para mim e que sempre me recebe com muito carinho.

À professora e amiga **Juliana Rodrigues Praetzel**, minha orientadora na iniciação científica, pessoa que sempre me incentivou a seguir a carreira acadêmica. Minha gratidão e admiração são enormes.

À minha orientadora, **Rachel de Oliveira Rocha**, que me acolheu, me ensinou, e fez com que eu acreditasse no meu potencial. Para mim, e com certeza para todos que têm o privilégio de conviver com ela, é exemplo de professora, pesquisadora, amiga, mãe. Também gostaria de fazer um agradecimento especial ao professor **Fábio Zovico M. Soares**, também exemplo de professor e pesquisador, e que tanto ajudou na construção desta dissertação.

Às funcionárias, **Verinha, Vera**, **Dalva** e **Sandrinha**, da Odontopediatria, pelos momentos de alegria e descontração, pelos mates, pelos biscoitinhos, pelos abraços apertados nos momentos em que precisei.

Às amizades que a odontopediatria me proporcionou, **Bruno Emanuelli**, **Bernardo Agostini**, **Janessa Engelmann**, **Yásmin Ramadan**, **Carine Pires**, **Graziela Botton**, **Brenda Nakashima, Fernanda Tomazoni**. Em especial aos meus amigos e colegas, **Gabriel Nicoloso** e **Flávia Vieira**, pelas horas de estudos, pelos seminários, projetos e também pelos momentos de descontração.

Aos **colegas de mestrado** que tive a honra de conviver nestes 2 anos. Juntos nós construímos o conhecimento, passamos por dificuldades, mas hoje temos a certeza que fizemos o melhor. Principalmente à colega **Flavia Marquezan**, pela amizade e pelo melhor chá da tarde.

À **Laís Regina Bée**, minha *best*, amiga inseparável, a qual agradeço todos os dias por fazer parte da minha vida. Juntas passamos, quem sabe, pelos momentos mais difíceis e felizes das nossas vidas, e junto com a **Rafaela Backes**, a qual também tenho a agradecer, escolhemos ficar e continuar nossa história em Santa Maria, mesmo depois de tudo o que se passou. Os primeiros meses foram difíceis, choramos juntas, nos consolamos, mas no fim conseguimos superar e hoje sei o quanto nossa união foi importante e é até hoje.

Ao meu amigo de faculdade, mestrado, especialização, trabalho e da vida, minha dupla, **Leonardo Miotti**, que esteve muito presente, em especial nestes dois últimos anos. Agradeço pela amizade que construímos, pelas conversas nas longas viagens à Florianópolis, pelos

conselhos, pelas brigas, pelos “puxões de orelha”, pelas risadas. Aproveito para agradecer aos pais do Leonardo, pelo acolhimento e por todo carinho que recebemos na residência **Miotti**.

Ao meu irmão, **Guilherme**, que mesmo distante sei o quanto torce pela minha felicidade e crescimento pessoal e profissional. Sinto um amor enorme por ele e também desejo que ele alcance todos os seus objetivos.

Finalmente, agradeço ao meu amor, meu companheiro, **Solano**. Muitas vezes fiquei distante, descontei minhas mágoas, mas ele sempre esteve forte, presente, me enchendo de amor e carinho e me incentivando a olhar para frente e alcançar meus objetivos. Sua maior prova de amor é apoiar minhas escolhas e ficar feliz com meu crescimento profissional. Sou muito feliz por ter esta pessoa iluminada ao meu lado. Agradeço também à família Borges por todo apoio nestes dois anos, pelo incentivo e compreensão. Muito obrigada!

“Tudo quanto penso,
Tudo quanto sou
É um deserto imenso
Onde nem eu estou.

Extensão parada
Sem nada a estar ali,
Areia peneirada
Vou dar-lhe a ferroada
Da vida que vivi.”

Tudo quanto penso
(Fernando Pessoa)

RESUMO

Dissertação de Mestrado
Programa de Pós-Graduação em Ciências Odontológicas
Universidade Federal de Santa Maria

EFEITO DO CONDICIONAMENTO ÁCIDO SELETIVO E DA CONDIÇÃO DO ESMALTE DECÍDUO UNIÃO DE UM SISTEMA ADESIVO UNIVERSAL

AUTORA: BRUNA FELTRIN ANTONIAZZI
ORIENTADORA: RACHEL DE OLIVEIRA ROCHA
Data e Local da Defesa: Santa Maria, 15 de junho de 2015.

Os sistemas adesivos universais foram desenvolvidos com o propósito de serem utilizados tanto na estratégia autocondicionante como com condicionamento ácido prévio. Estudos laboratoriais que testem a resistência de união destes sistemas adesivos em diferentes condições do substrato são imprescindíveis para predizer o seu comportamento clínico. Dessa forma, o objetivo deste estudo foi comparar a resistência de união do sistema adesivo Single Bond Universal nas duas estratégias de aplicação (SBU-ER e SBU-SE) com um sistema adesivo autocondicionante de dois passos - Clearfil SE Bond (CSE) ao esmalte de dentes decíduos hígidos e desmineralizados. 36 molares decíduos foram selecionados e alocados em 6 grupos (n=6). As secções vestibulares e linguais tiveram suas superfícies abrasionadas e o grupo de dentes desmineralizados foram submetidos à ciclagem de pH. O protocolo adesivo foi realizado conforme recomendações dos fabricantes. A metodologia empregada para avaliar a resistência de união foi a de microcisalhamento e os dados foram obtidos em MPa. Após teste de normalidade Kolmogorov-Smirnov, os resultados foram submetidos a análise de variância e teste de Tukey (α = 0,05). O sistema adesivo SBU no modo ER apresentou valores de resistência de união (16,57±6,55) estatisticamente superiores ao SBU-SE (10,79±4,75) e ao sistema CSE (12.62±5,42) , sendo que os dois últimos foram similares estatisticamente. A condição do substrato influenciou os valores de resistência de união, sendo que o esmalte desmineralizado (9,22±4,07) apresentou resultados estatisticamente inferiores ao esmalte hígido (17,44±4,07). Conclui-se que o uso do condicionamento ácido previamente à aplicação do sistema adesivo universal testado melhora os valores de resistência de união ao esmalte de dentes decíduos. Além disso, a desmineralização do esmalte influencia negativamente o desempenho laboratorial dos sistemas adesivos testados.

Palavras-chave: Dente Decíduo. Desmineralização Dentária. Resistência ao Cisalhamento.

ABSTRACT

Master's Dissertation
Graduate Program in Dental Science
Federal University of Santa Maria

EFFECT OF SELECTIVE ACID ETCHING AND PRIMARY ENAMEL CONDITION IN BOND OF A UNIVERSAL ADHESIVE SYSTEM

AUTHOR: BRUNA FELTRIN ANTONIAZZI
ADVISOR: RACHEL DE OLIVEIRA ROCHA
Defense Place and Date: Santa Maria, June 15, 2015.

Universal adhesive systems were developed with the purpose of being used both in self-etching or acid-etching strategy. Laboratory studies to test the bond strength of these adhesive systems under different conditions of the substrate are essential to predict their clinical behavior. Thus, the aim of this study was to compare the bond strength of Scotchbond Universal Adhesive system in both strategies (SBU-ER and SBU-SE) with a two-step self-etch adhesive system - Clearfil SE Bond (CSE) to enamel of sound and demineralized primary teeth. 36 primary molars was selected and allocated into 6 groups (n=6). The buccal and lingual sections were ground and the group of demineralized teeth was submitted to pH cycling. The adhesive protocol was performed according to manufacturers' instructions. The methodology used to evaluate the bond strength was the microshear and data were obtained in MPa. After Kolmogorov-Smirnov normality test, the results were submitted to ANOVA and Tukey test ($\alpha = 0.05$). The SBU adhesive system in the ER mode presented bond strength values (16.57 ± 6.55) statistically higher than SBU-SE (10.79 ± 4.75) and the CSE system (12.62 ± 5.42) and the last two were statistically similar. Substrate condition influenced the bond strength values, and the demineralized enamel (9.22 ± 4.07) were statistically lower than sound enamel (17.44 ± 4.07). It was concluded that the use of acid conditioning prior to the application of universal adhesive system tested improve bond strength values to primary teeth enamel. In addition, enamel demineralized negatively influences the performance of tested adhesive systems.

Keywords: Tooth, Deciduous. Tooth Demineralization. Shear Strength.

SUMÁRIO

INTRODUÇÃO

Os sistemas adesivos autocondicionantes surgiram com o propósito de simplificar e, sobretudo, diminuir a sensibilidade da técnica de aplicação, especialmente em dentina. No entanto, a união destes sistemas adesivos ao esmalte não é tão previsível quanto a obtida quando da realização do condicionamento ácido (VAN MEERBEEK et al., 2011). Apesar de alguns estudos mostrarem que não há diferença nos valores de resistência de união de sistemas autocondicionantes ao esmalte instrumentado comparados aos de sistemas de condicionamento ácido prévio (ABDALLA et al., 2010; REIS et al., 2010), isto não acontece quando da união ao esmalte não instrumentado, principalmente quando são utilizados sistemas adesivos classificados, em função do pH, como ultra-suaves (pH≥ 2,5). Isto porque estes apresentam menor potencial de desmineralização do esmalte e com isso, de gerar as microporosidades necessárias para o embricamento micromecânico (VAN MEERBEEK et al., 2011). Assim, na tentativa de melhorar a união dos sistemas autocondicionantes ao esmalte, alguns autores recomendam o condicionamento ácido seletivo (FRANKENBERGER et al., 2008; LÜHRS et al., 2008; ROTTA et al., 2007), ou seja, limitado a esse substrato. Contudo, com esta modificação da técnica, o condicionamento não intencional da dentina é possível de ocorrer, o que pode comprometer a resistência de união a esse substrato e pôr em risco a durabilidade da união, em razão da incompleta infiltração do sistema adesivo ao longo de toda a extensão de fibras colágenas expostas pela desmineralização excessiva (FRANKENBERGER et al., 2008; TORII et al., 2002).

Deste modo, a busca pelo aprimoramento dos sistemas adesivos com o intuito de obterem-se resultados cada vez mais previsíveis e duradouros, fez com que, recentemente, fossem desenvolvidos novos sistemas adesivos, intitulados “universais” ou “multi-modais” (HANABUSA et al., 2012; PERDIGÃO; SEZINANDO; MONTEIRO, 2012) que, segundo os fabricantes, podem ser utilizados tanto na estratégia de condicionamento ácido total ou seletivo em esmalte como autocondicionante, e se propõem a diminuir a sensibilidade operatória em dentina. O sistema adesivo Single Bond Universal (3M ESPE) foi proposto para utilização nestas diferentes abordagens. Este possui a incorporação do monômero acídico 10-MDP, que de forma similar ao copolímero do ácido polialquenóico também presente na sua formulação, promove adesão química ao esmalte e a dentina através de ligações com o cálcio presente na estrutura dental (VAN LANDUYT et al., 2007; YOSHIDA et al., 2004).

Ainda é atribuída à presença do copolímero do ácido polialquenóico nos sistemas que o contém melhor estabilidade em condições de umidade (VAN LANDUYT et al., 2007).

Os estudos que já avaliaram este novo sistema adesivo mostram que o comportamento clínico deste material em lesões cervicais não depende da estratégia adesiva utilizada (PERDIGÃO et al., 2013), apesar de, laboratorialmente, apresentar valores de resistência de união em dentina inferiores aos sistemas considerados como controles (Adper Single Bond 2 e Clearfil SE Bond) (MUÑOZ et al., 2013). Estudo que avaliou a resistência de união deste material ao esmalte de dentes permanentes encontrou valores estatisticamente superiores quando foi utilizada a estratégia de condicionamento ácido prévio (DE GOES; SHINOHARA; FREITAS, 2014). Porém, ainda não estão disponíveis estudos que tenham avaliado o desempenho deste material em esmalte decíduo, que apresenta menor mineralização (menor concentração de cálcio e potássio) e diferenças na microestrutura, como a maior densidade numérica de prismas, e também uma camada mais delgada de esmalte quando comparados aos dentes permanentes (DE MENEZES OLIVEIRA et al., 2010; WILSON; BEYNON, 1989), características que possivelmente determinam diferentes respostas em termos de resistência de união (TEDESCO et al., 2014; LENZI et al., 2013), justificando a avaliação deste sistema adesivo neste substrato. Além disso, são necessários estudos que considerem também, diferentes condições do esmalte, dada a possibilidade da adesão ao esmalte desmineralizado presente no ângulo cavo superficial de cavidades de cárie, nas quais a remoção de dentina cariada tenha sido realizada com instrumentos manuais, fundamentada na abordagem de remoção parcial de dentina cariada (CASAGRANDE et al., 2009).

1. PROPOSIÇÃO

O objetivo desta dissertação foi investigar a influência da estratégia adesiva e da condição do esmalte no desempenho de um sistema adesivo universal.

2. ARTIGO

Esta dissertação está baseada nas normativas da Universidade Federal da Santa Maria. Sendo assim, é composta de um artigo que será enviado para publicação no periódico "*The Journal of Adhesive Dentistry"*.

Artigo

*"*SELECTIVE ACID-ETCHING IMPROVES THE BOND STRENGTH OF UNIVERSAL ADHESIVE TO SOUND AND DEMINERALIZED ENAMEL OF PRIMARY TEETH"

Antoniazzi BF, Nicoloso GF, Lenzi TL, Soares FZM, Rocha RO.

Title page

Selective acid-etching improves the bond strength of universal adhesive to sound and demineralized enamel of primary teeth

Bruna Feltrin Antoniazzi
DDS
Post Graduate Program in Dental Science, Federal University of Santa Maria, Brazil
Rua Marechal Floriano Peixoto, 1184, 97015-270, Santa Maria, RS, Brazil

Contribution to the paper: Performed the experiments, wrote the manuscript.

Gabriel Ferreira Nicoloso
DDS
Post Graduate Program in Dental Science, Federal University of Santa Maria, Brazil
Rua Marechal Floriano Peixoto, 1184, 97015-270, Santa Maria, RS, Brazil

Contribution to the paper: Hypothesis, Proofread the manuscript.

Tathiane Larissa Lenzi
Professor
Post Graduate Program in Dental Science, Federal University of Santa Maria, Brazil
Rua Marechal Floriano Peixoto, 1184, 97015-270, Santa Maria, RS, Brazil

Contribution to the paper: Consulted on idea, hypothesis, proofread the manuscript.

Fabio Zovico Maxnuck Soares

Professor

Department of Restorative Dentistry, Federal University of Santa Maria, Brazil
Rua Marechal Floriano Peixoto, 1184, 97015-270, Santa Maria, RS, Brazil

Contribution to the paper: Contribution substantially to discussion, proofread the manuscript.

Rachel de Oliveira Rocha

Associate Professor

Department of Stomatology, Federal University of Santa Maria, Brazil
Rua Marechal Floriano Peixoto, 1184, 97015-270, Santa Maria, RS, Brazil

Contribution to the paper: Idea, contribution substantially to discussion, proofread the manuscript.

✉**Corresponding author:**
Rachel de Oliveira Rocha
Department of Stomatology, Federal University of Santa Maria
Rua Marechal Floriano Peixoto, 1184, 97015-270, Santa Maria, RS, Brazil

Phone: +55 55 3220 9266

E-mail address: rachelrocha@smail.ufsm.br

ABSTRACT

Purpose: To evaluate the influence of enamel condition and the bond strategy on bond strength of a multimode adhesive. Material and Methods: Thirty-six primary molars (n=6) were used to evaluate microshear bond strength of Scotchbond Universal Adhesive (SBU) used in both strategies (ER and SE) compared to Clearfil SE Bond as self-etch control both on sound (SND) and demineralized (DEM) enamel. The crowns were sectioned rendering two specimens that were grinded in #600 sandpaper obtaining flat enamel surfaces. For demineralized group, specimens were submitted to pH cycling for 14 days. Adhesive systems were applied equally on both substrates according to manufacturer's instructions and four composite cylinders (0.96 mm^2) were built on each surface with the aid of starch tubes and light cured. After 24h storage in distilled water specimen were subjected to microshear test at 1mm/min until fracture. Data in MPa were submitted to two-way ANOVA and Tukey post-hoc test (5%). Results: Mean (SD) for experimental groups were: SBU(ER) SND: 21.06(5.45), SBU(SE) SND:14.62(3.18), CSE SND:16.63(2.61), SBU(ER) DEM: 12.09(4.07), SBU(SE) DEM: 6.96(2.06) CSE DEM: 8.6(4.36). Significant statistically differences were found among adhesive systems ($p = 0.003$) and substrate condition ($p = 0.000$). Conclusions: Enamel etching with phosphoric acid improves bond strength of universal adhesive system to primary enamel. Demineralized primary enamel produces lower bond strength.

Keywords: Multi-mode adhesive; Microshear bond strength; Enamel; Etching strategy.

INTRODUCTION

Since 1955, when Buonocore introduced the concept of adhesion to enamel[2], many studies have been conducted in order to obtain adhesive systems that can effectively bond to enamel and dentin, reducing both clinical time and technique sensitivity. Although enamel is a homogeneous structure, which bonding is simpler and predictable than to dentine, concern for bonding to this substrate is potentially relevant when self-etch adhesives systems are considered.

This concern is also valid to "universal" or "multi-mode" adhesive systems enabling the election of the adhesive approach (self-etch or etch-and-rinse), depending on the clinical conditions, or even applying both techniques in selective enamel etching. The effect of adhesion strategy on bond strength to enamel remains unclear. While in a clinical study the etch-and-rinse mode did not influence the retention of non-carious cervical restorations[14], in the other hand, in-vitro studies showed that the use of acid etching prior the application of an universal adhesive improved the bond strength values(DE GOES; SHINOHARA; FREITAS, 2014),[11]. In a recent systematic review, prior acid etching to universal adhesives improves the bond strength to enamel[18], confirming what is advocate that the selective acid etching on enamel produce more durable bond to enamel and protection to dentin bond degradation.[25]

Despite several studies evaluated bond to sound enamel, the adhesion to demineralized enamel still unclear. Minimum intervention and maximum preservation approaches are becoming routine, where partial caries removal is performed, usually with manual or low-speed rotary instruments.[3,12] That will lead to dealing with less mineralized enamel in which the restorative material will be adhered. Demineralized enamel is a different substrate than sound enamel, and reduced bond strength was observed to it.[22] To date, no studies have evaluated the bond strength of Scotchbond Universal Adhesive (3M ESPE), one representative of universal or multi-mode category of adhesive system, to demineralized

enamel of primary teeth. Since primary and permanent teeth present differences in enamel microstructure and composition, and these characteristics may interfere with etching pattern,[6,13] studies are also required to evaluate the influence of bonding strategy on bond strength of a new universal adhesive system to primary teeth enamel.

On the above, the aim of this study was to evaluate the influence of enamel condition and the selective acid etching on bond strength of universal adhesive. The null hypothesis tested were: (1) there is no influence of enamel condition on the bond strength values; (2) there is no difference in bond strength promoted by single bond universal under etch-and-rinse or self-etch mode.

MATERIALS AND METHODS

Selection and tooth preparation

Institutional Ethics Committee previously approved the study protocol. After obtaining patients' informed consent, thirty-six sound primary molars were selected from a pool of stored in 0.5% aqueous chloramine. Teeth were randomly assigned to 6 experimental groups (n=6), according adhesive system and enamel condition as shown in Figure 1.

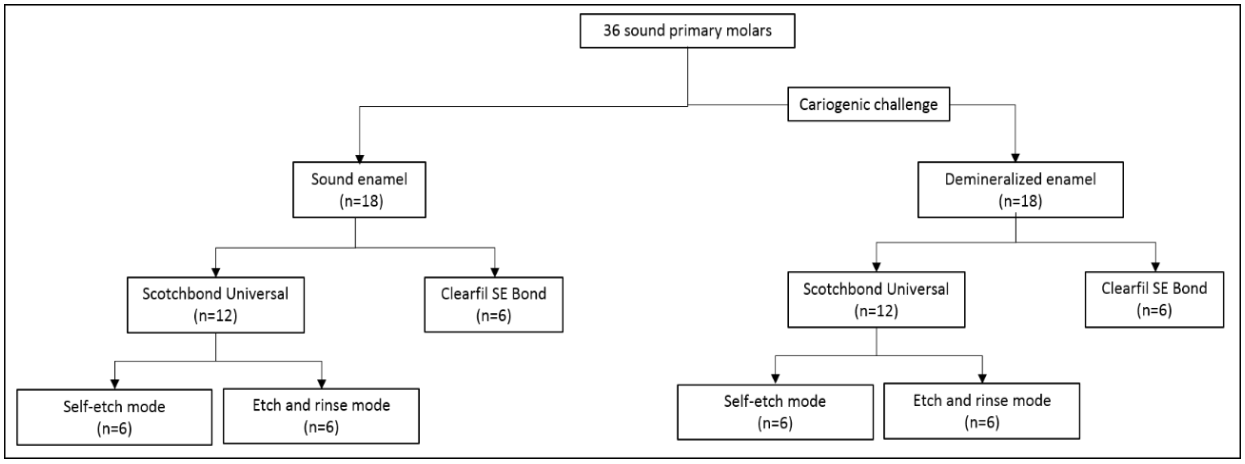

Figure 1. Experimental design

The roots of all teeth were removed by sectioning in a cutting machine with a low-speed water-cooled diamond saw (Labcut 1010, Extec Co, Enfield, CT, USA). The crowns were then sectioned mesiodistally, parallel to long axis to produce two enamel sections (buccal and lingual). Each section were carefully identified and individually embebed in self-curing acrylic resin (JET clássico, São Paulo, SP, Brazil) to facilitate handling, leaving buccal and lingual surfaces exposed.

The exposed surfaces were ground manually with 600-grit SiC paper under water lubrification, to create flat enamel surfaces[22].

Caries induction

Specimens in the demineralized enamel groups were subjected to in vitro caries induction by pH cycling prior restorative procedures. Cariogenic challenge was done by immersion of each specimen separately in 10 ml of demineralizing solution for 8 h (2.2 mM $CaCl_2$, 2.2 mM NaH_2PO_4, 0.05 M acetic acid adjusted to pH 4.5 with 1M KOH) and in 10 ml of remineralizing solution for 16 h (1.5 mM $CaCl_2$, 0.9 mM NaH_2PO_4, 0.15 mM KCl to adjusted to pH 7.0)[23]. This procedure was repeated for 14 cycles.

Bonding procedures

Two adhesive systems were used – Scotchbond Universal Adhesive (SBU) in self-etch (SE) and etch-and-rinse (ER) modes and Clearfil SE Bond (CSE). Their composition and application mode are described in Table 1. Adhesives were applied on enamel surfaces according manufacturers' instructions by a single trained operator. Prior to light-curing the adhesives four starch tubes[21] (Renata, Selmi, Londrina, PR, Brazil) with the internal diameter of 0.96 mm^2 and a heigth of 1mm were carefully positioned over the each enamel surface and then light curing was performed (Emiter C, Schuster LTDA, Santa Maria, RS, Brazil). Resin

composite (Z250, 3M ESPE, St Paul, MN, USA, shade A3) was packed inside the tubes and ligth-cured for 20 s each.

After 24h of water storage at 37°C, the starch tubes were removed using air/water spray. Each specimen was examined under a stereomicroscope (Stereo Discovery V20, Carl Zeiss do Brasil, Rio de Janeiro, RJ, Brazil) at 40 x magnification and those with any composite inclusion defect were eliminated and replaced.

Table 1. Adhesive systems, composition and application mode.

	Scotchbond Universal Adhesive(SBU)		**Clearfil SE Bond (CSE)**
Mode	One-step self-etch (SE)	Two-steps etch-and-rinse (ER)	Two-steps self-etch
Manufacturer	3M ESPE, St Paul, MN,USA		Kuraray Co. Okayama, Japan
Batch #			
Main components	MDP phosphate monomer, dimethacrylate resins, HEMA, methacrylate modified polyalkenoic acid copolymer, filler, ethanol, water, initiators, silane	Etchant: 34% phosphoric acid, water, synthetic amorphous silica, polyethylene glycol, aluminium oxide Adhesive: MDP phosphate monomer, dimethacrylate resins, HEMA, methacrylate modified polyalkenoic acid copolymer, filler, ethanol, water, initiators, silane	*Primer:* MDP, HEMA, hydrophilic dimethacrylate, dl-campherquinone ,N,N-diethanol-*p*-toluidine, water *Bonding:* MDP, Bis-GMA, HEMA, hydrophobic dimethacrylate, dl-campherquinone, N,N-diethanol-*p*-toluidine, silanated colloidal silica
Application mode*	Apply the adhesive for 20 s with vigorous agitation Gentle air thin for 5 s Light-cure for 10 s	Apply etchant for 15s Rinse for 10s Air dry to remove excess of water Apply the adhesive as for the self-etch mode	Apply 2 consecutive coats of adhesive for 15 s with gentle agitation Gently air dry for 5 s Light-cure for 10 s

MDP: 10-methacryloyloxydecyl-dihydrogen-phosphate; Bis-GMA: bisphenyl-glycidyl methacrylate; HEMA: 2-hydroxyethyl methacrylate
*According manufacturer's instructions.

Microshear bond strength

The microshear bond strength was tested in a universal machine (DL 1000, Emic Equipamentos e Sistemas de Ensaio Ltda., São Jose dos Pinhais, PR, Brazil) using a stainless still wire loop (0.2 mm in diameter) placed as close as possible to resin/enamel interface. A shear force was applied with a crosshead speed of 1mm/min until failure. The specimens that failed prior the test were considered as premature failures and were excluded from the bond strength values calculation.

Failure mode

Specimens were examined under a stereomicroscope at 400 x magnification and failures were classified as mixed/adhesive or cohesive (resin composite or enamel) by a blinded examiner.

Statistical analysis

The bond strength values were calculated in MPa as means and standard deviations. A normal distribution of the data verified by Kolmogorov-Smirnov test and values were submitted to two-way analysis of variance (ANOVA) and Tukey post-hoc test for multiple comparisons. Significance level of 5% was considered in all analysis that were performed with Minitab 17 (Minitab Inc, State Colege, PA, USA).

Results

Descriptive statistics are presented in Table 2, including mean values of bond strength, standard deviations and tested/premature failures specimens. Two-way ANOVA revealed statistically significant differences among adhesive systems ($p = 0.003$) and between enamel condition ($p = 0.000$). No significant differences were found however to interaction between

factors (p = 0.909). This way, we can consider that evaluated adhesives systems were equally influenced by substrate condition. SBU performed better in etch-and-rinse mode (SBU-ER) as shown in Table 3. Although the bond strength values reported for this system, when used as a self-etch (SBU-SE), were similar to CSE, as expected, they were lower than those obtained when phosphoric acid was used.

Demineralized enamel negatively affected the bond strength, with values approximately 50% lower than those obtained in sound enamel (Table 4). Moreover, premature failures were just observed to demineralized groups associated to SBU (SE) and CSE adhesives.

All failures were classified as mixed/adhesive with no cohesive failures in any experimental group.

Table 2. Descriptive statistics of experimental groups – □SBS means (standard deviations) (tested/pre-test failure specimens)

Adhesive systems (etching mode)	**Enamel condition**	
	Sound	**Desmineralized**
SBU (ER)	21.06 (5.45) (15/0)	12.09 (4.07) (15/0)
SBU (SE)	14.62 (3.18) (19/0)	6.96 (2.06) (20/3)
CSE	16.63 (2.61) (24/0)	8.60 (4.36) (22/5)

Table 3. μSBS means (standard deviations) for adhesive systems irrespective to the enamel condition*

Adhesive system (etching mode)	**MPa**
SBU (ER)	16.57 (6.55)^{A}
SBU (SE)	10.79 (4.75)^{B}
CSE	12.62 (5.42)^{B}

* Different superscript letters indicate statistically significant differences ($p<0.05$).

Table 4. µSBS means (standard deviations) for enamel condition irrespective to the adhesive system*

Enamel condition	MPa
Sound	17.44 (4.62)[A]
Demineralized	9.22 (4.07)[B]

* Different superscript letters indicate statistically significant differences ($p<0.05$).

Discussion

Adhesion to enamel has been considered reliable and durable[26] since the acid-etching technique was introduced by Buonocore.[2] However, the clinical requirements for simplicity, faster application and low-sensitivity technique motivate the use of self-etch materials and, more recently, universal systems, in both enamel and dentin.[9,17,5]

In this study, the use of separate acid etching with Scotchbond Universal Adhesive, improved the bond strength to enamel and, therefore, the null hypothesis that there would be no differences based on etching mode was rejected. These findings were expected based on the fact that selective acid etching step also improves the clinical and laboratory performance of universal and self-etch adhesives to enamel. [5,7-9,15,16,18,19] It is noteworthy however, that this finding is not available for the dentin, for which previous acid etching step does not seem to be important.[28]

Although the need of enamel acid etching seems to be consensus when using self-etch systems, that depends on each material, mainly on the pH of the adhesive solution. CSE is considered as mild system and the results of this study confirm that adhesion of mild self-etching systems to enamel still remains unsatisfactory so selective enamel technique is still necessary.[1,17] It could be expected however, that CSE presented better performance than SBU on self-etching mode, but this was not observed in this study. Although SBU presents a relatively low acidity (pH=2.7) and, consequently, a considerably reduced ability to

demineralize the enamel in comparison with CSE (pH=2.0), both adhesives showed similar bond strength values. Based on this, selective acid etching on enamel before the use self-etch adhesive seems to be strongly recommended.[11,16] Despite this, in a recent study,[27] the active application of CSE improved bond strength values to enamel, thus being an alternative to enamel selective acid etching. However, it does not seem to be valid for SBU, which has not been benefited from the active application.[10]

The first null hypothesis that enamel condition would not influence the bond strength values also was reject. Lower bond strength values were obtained for demineralized enamel, irrespective of the adhesive system or etching stragegy, compared to sound enamel probably due to the lower amount. This may attributed to the lower amount of minerals, higher porosity of the surface[4] and enlargement of the intercrystalline spaces.[20] This is an important result considering the possible presence of demineralized enamel around cavities subjected to carious dentin removal with hand instruments or low-speed rotary burs, usually employed in minimally invasive approaches. It may suggest that the surrounding enamel should to be removed to allow better bonding and effective protection to dentin bonding degradation.

The used in vitro caries model causes similar subsurface mineral losses, albeit not as deep as natural lesions,[22] because the fluctuations of pH in the oral environment are more intense and can occur for longer periods. Therefore, in clinical situations the performance of evaluated adhesive systems could be even worse. In addition, to the best of our knowledge, this pioneering investigation assessed the influence of demineralized enamel on bond strength of a universal adhesive.

Besides, the use of primary enamel is also relevant considering the differences in minerals concentration and in microstructure compared to permanent[6,29] enamel, which can negatively influence on adhesion[13]. Further studies evaluating the bond degradation of

universal adhesive applied to primary enamel following both etch-and-rinse and self-etch strategies are required.

In conclusion, the universal adhesive does not share the same versatility of being used in the etch-and-rinse and self-etch approaches on enamel primary teeth. The prior enamel acid etching improve bond strength values of universal adhesive system to primary enamel. Demineralized enamel is a worst substrate to adhesion.

Clinical relevance: Selective acid etching is preferable when universal adhesive system is used in primary enamel.

References

1. Abdalla AI, El Zohairy AA, Abdel Mohsen MM, Feilzer AJ. Bond efficacy and interface morphology of self-etching adhesives to ground enamel. J Adhes Dent 2010;12:19–25.

2. Buonocore MG. A simple method of increasing the adhesion of acrylic filling materials to enamel surfaces. J Dent Res 1955;34:849–853.

3. Casagrande L, Falster CA, Di Hipolito V, De Góes MF, Straffon LH, Nör JE, de Araújo FB. Effect of adhesive restorations over incomplete dentin caries removal: 5-year follow-up study in primary teeth. J Dent Child 2009;76:117–122.

4. Davila JM, Buonocore MG, Greeley CB, Provenza DV. Adhesive penetration in human artificial and natural white spots. J Dent Res 1975;54:999-1010.

5. De Goes MF, Shinohara MS, Freitas MS. Performance of a new one-step multi-mode adhesive on etched vs non-etched enamel on bond strength and interfacial morphology. J Adhes Dent 2014;16:243–250.

6. De Menezes Oliveira MA, Torres CP, Gomes-Silva JM, Chinelatti MA, De Menezes FC, Palma-Dibb RG, Borsatto MC. Microstructure and mineral composition of dental enamel of permanent and deciduous teeth. Microsc Res Tech 2010;73:572–577.

7. Erickson RL, Barkmeier WW, Latta MA. The role of etching in bonding to enamel: a comparison of self-etching and etch-and-rinse adhesive systems. Dent Mater 2009;25:1459–1467.

8. Goracci C, Rengo C, Eusepi L, Juloski J, Vichi A, Ferrari M. Influence of selective enamel etching on the bonding effectiveness of a new “all-in-one” adhesive. Am J Dent 2013;26:99–104.

9. Hanabusa M, Mine A, Kuboki T, Momoi Y, Van Ende A, Van Meerbeek B, De Munck J. Bonding effectiveness of a new “multi-mode” adhesive to enamel and dentine. J Dent 2012;40:475–484.

10. Loguercio AD, Muñoz MA, Luque-Martinez I, Hass V, Reis A, Perdigão J. Does active application of universal adhesives to enamel in self-etch mode improve their performance? J Dent 2015; http://dx.doi.org/10.1016/j.jdent.2015.04.005

11. McLean DE, Meyers EJ, Guillory VL, Vandewalle KS. Enamel bond strength of new universal adhesive bonding agents. Oper Dent 2015;[Epub ahead of print].

12. Maltz M, Jardim JJ, Mestrinho HD, Yamaguti PM, Podestá K, Moura MS, de Paula LM. Partial removal of carious dentine: a multicenter randomized controlled trial and 18-month follow-up results. Caries Res 2013;47:103–109.

13. Marquezan M, da Silveira BL, Burnett LH, Rodrigues CRMD, Kramer PF. Microtensile bond strength of contemporary adhesives to primary enamel and dentin. J Clin Pediatr Dent 2008;32:127–132.

14. Perdigão J, Kose C, Mena-Serrano A, De Paula E, Tay L, Reis A, Loguercio AD. A New Universal Simplified Adhesive: 18-Month Clinical Evaluation. Oper Dent 2013;39:113–127.

15. Peumans M, De Munck J, Van Landuyt K, Van Meerbeek B. Thirteen-year randomized controlled clinical trial of a two-step self-etch adhesive in non-carious cervical lesions. Dent Mater 2015;31:308–314.

16. Peumans M, Munck J De, Landuyt KL Van, Poitevin A, Lambrechts P, Meerbeek B Van. Eight-year clinical evaluation of a 2-step self-etch adhesive with and without selective enamel etching. Dent Mater 2010;26:1176–1184.

17. Reis A, Zander-Grande C, Kossatz S, Stanislawczuk R, Manso A, de Carvalho RM,Loguercio AD. Effect of mode of application on the microtensile bond strength of a self-etch and etch-and-rinse adhesive system. Oper Dent 2010;35:428–435.

18. Rosa WL, Piva E, Silva AF. Bond strength of universal adhesives: A systematic review and meta-analysis. J Dent 2015;http://dx.doi.org/10.1016/j.jdent.2015.04.003.

19. Rotta M, Bresciani P, Moura SK, Grande RHM, Hilgert LA, Baratieri LN, Loguercio AD, Reis A. Effects of phosphoric acid pretreatment and substitution of bonding resin on bonding effectiveness of self-etching systems to enamel. J Adhes Dent 2007;9:537–545.

20. Schmidlin PR, Zehnder M, Pasqualetti T, Imfeld T, Besek MJ. Penetration of a bonding agent into de- and remineralized enamel in vitro. J Adhes Dent 2004;6:111-115.

21. Tedesco TK, Montagner AF, Skupien JA, Soares FZ, Susin AH, Rocha R de O. Starch tubing: an alternative method to build up microshear bond test specimens. J Adhes Dent 2013;15:311–315.

22. Tedesco TK, Soares FZM, Grande RHM, Filho LER, Rocha R de O. Effect of cariogenic challenge on bond strength of adhesive systems to sound and demineralized primary and permanent enamel. J Adhes Dent. 2014;16:421–428.

23. Ten Cate JM, Duijsters PP. Alternating demineralization and remineralization of artificial enamel lesions. Caries Res 1982;16:201–210.

24. Van Landuyt KL, Snauwaert J, De Munck J, Peumans M, Yoshida Y, Poitevin A, Coutinho E, Suzuki K, Lambrechts P, Van Meerbeek B. Systematic review of the chemical composition of contemporary dental adhesives. Biomaterials 2007;28:3757–3785.

25.Van Meerbeek B, Yoshihara K, Yoshida Y, Mine A, De Munck J, Van Landuyt KL. State of the art of self-etch adhesives. Dental Mater 2011;27:17-28.

26. Van Meerbeek B, De Munck, Yoshida Y, Inoue S, Vargas M, Vijay P, et al. Buonocore memorial lecture. Adhesion to enamel and dentin current status and future challenges. Oper Dent 2003;28:215–235.

27. Vinagre A, Ramos J, Messias A, Marques F, Caramelo F, Mata A. Microtensile bond strength and micromorphology of bur-cut enamel using five adhesive systems. J Adhes Dent 2015;doi:0.3290/j.jad.a34060.[Epub ahead of print].

28. Wagner A, Wendler M, Petschelt A, Belli R, Lohbauer U. Bonding performance of univeral adhesives in different etching modes. J Dent 2014;42:800-807.

29. Wilson PR, Beynon AD. Mineralization differences between human deciduous and permanent enamel measured by quantitative microradiography. Arch Oral Biol 1989;34:85–88.

3. CONSIDERAÇÕES FINAIS

Esta dissertação avaliou a condição do substrato do esmalte decíduo (hígido ou desmineralizado) na resistência de união de um sistema adesivo universal nas duas estratégias de aplicação e de um sistema adesivo autocondicionante de dois passos.

Os sistemas adesivos testados se comportaram da maneira esperada, dado que o uso do condicionamento com ácido fosfórico a 37% é considerado padrão de referência para o esmalte. Além disso, a inferioridade estatística dos adesivos aplicados no modo autocondicionante em comparação ao uso do condicionamento ácido prévio confirmam este dado.

Quanto à condição do substrato, a superioridade dos resultados de resistência de união ao esmalte hígido em comparação ao esmalte desmineralizado já era esperado e foi comprovado após análise estatística. Deve ser ressaltado a importância destes resultados dada a consolidação da odontologia minimamente invasiva.

Apesar das limitações desse estudo laboratorial, esse é o primeiro passo para o conhecimento do comportamento destes sistemas adesivos para que os mesmos possam ser usados clinicamente com maior previsibilidade.

REFERÊNCIAS BIBLIOGRÁFICAS

ABDALLA, A. I. et al. Bond efficacy and interface morphology of self-etching adhesives to ground enamel. **The Journal of Adhesive Dentistry**, v. 12, n. 1, p. 19–25, fev. 2010.

BUONOCORE, M. G. A simple method of increasing the adhesion of acrylic filling materials to enamel surfaces. **Journal of Dental Research**, v. 34, n. 6, p. 849-53, dez. 1955.

CASAGRANDE, L. et al. Effect of adhesive restorations over incomplete dentin caries removal: 5-year follow-up study in primary teeth. **Journal of Dentistry for Children (Chic)**, v. 76, n. 2, p. 117–122, maio 2009.

DAVILA J.M. et al. Adhesive penetration in human artificial and natural white spots. **Journal of Dental Research**, v. 54, n. 5, p. 999-1010, set 1975.

DE GOES, M. F.; SHINOHARA, M. S.; FREITAS, M. S. Performance of a new one-step multi-mode adhesive on etched vs non-etched enamel on bond strength and interfacial morphology. **The Journal of Adhesive Dentistry**, v. 16, n. 3, p. 243–50, jun. 2014.

DE MENEZES OLIVEIRA, M. A. H. et al. Microstructure and mineral composition of dental enamel of permanent and deciduous teeth. **Microscopy Research and Technique**, v. 73, n. 5, p. 572–7, maio 2010.

ERICKSON, R. L.; BARKMEIER, W. W.; LATTA, M. A. The role of etching in bonding to enamel: a comparison of self-etching and etch-and-rinse adhesive systems. **Dental materials**, v. 25, n. 11, p. 1459–67, nov. 2009.

FRANKENBERGER, R. et al. Selective enamel etching reconsidered: better than etch-and-rinse and self-etch? **The Journal of Adhesive Dentistry**, v. 10, n. 5, p. 339–44, out. 2008.

GORACCI, C. et al. Influence of selective enamel etching on the bonding effectiveness of a new “all-in-one” adhesive. **American journal of dentistry**, v. 26, n. 2, p. 99–104, abr. 2013.

HANABUSA, M. et al. Bonding effectiveness of a new “multi-mode” adhesive to enamel and dentine. **Journal of Dentistry**, v. 40, n. 6, p. 475–84, jun. 2012.

LENZI, T. L. et al. One-step self-etch adhesive bonding to pre-etched primary and permanent enamel. **Journal of dentistry for children (Chicago, III)**, v. 80, n. 2, p. 57-61, maio 2013.

LOGUERCIO, A. D. et al. Does active application of universal adhesives to enamel in self-etch mode improve their performance? **Journal of Dentistry**, 2015. In press.

LÜHRS, A.-K. et al. Shear bond strength of self-etch adhesives to enamel with additional phosphoric acid etching. **Operative Dentistry**, v. 33, n. 2, p. 155–62, mar. 2008.

MALTZ, M. et al. Partial removal of carious dentine: a multicenter randomized controlled trial and 18-month follow-up results. **Caries Research**, v. 47, n. 2, p. 103–9, jan. 2013.

MARQUEZAN, M. et al. Microtensile bond strength of contemporary adhesives to primary enamel and dentin. **The Journal of Clinical Pediatric Dentistry**, v. 32, n. 2, p. 127–32, jan. 2008.

MCLEAN, D. et al. Enamel Bond Strength of New Universal Adhesive Bonding Agents. **Operative Dentistry**, 2015. In press.

MUÑOZ, M. A. et al. Immediate bonding properties of universal adhesives to dentine. **Journal of Dentistry**, v. 41, n. 5, p. 404–11, maio 2013.

PERDIGÃO, J. et al. A New Universal Simplified Adhesive: 18-Month Clinical Evaluation. **Operative Dentistry**, v. 39, n. 2, p. 113–127, jun. 2013.

PERDIGÃO, J.; SEZINANDO, A.; MONTEIRO, P. C. Laboratory bonding ability of a multi-purpose dentin adhesive. **American Journal of Dentistry**, v. 25, n. 3, p. 153–158, ago. 2012.

PEUMANS, M. et al. Thirteen-year randomized controlled clinical trial of a two-step self-etch adhesive in non-carious cervical lesions. **Dental Materials**, v. 31, n. 3, p. 308-14, mar. 2015.

PEUMANS, M. et al. Eight-year clinical evaluation of a 2-step self-etch adhesive with and without selective enamel etching. **Dental Materials**, v. 26, n. 12, p. 1176-84, dez. 2010.

REIS, A. et al. Effect of mode of application on the microtensile bond strength of a self-etch and etch-and-rinse adhesive system. **Operative Dentistry**, v. 35, n. 4, p. 428–35, jul. 2010.

ROSA, W. L. DE O. DA; PIVA, E.; SILVA, A. F. DA. Bond strength of universal adhesives: A systematic review and meta-analysis. **Journal of Dentistry**, 2015. In press

ROTTA, M. et al. Effects of phosphoric acid pretreatment and substitution of bonding resin on bonding effectiveness of self-etching systems to enamel. **The Journal of Adhesive Dentistry**, v. 9, n. 6, p. 537–45, dez. 2007.

SCHMIDLIN, P.R. et al. Penetration of a bonding agent into de- and remineralized enamel in vitro. **The Journal of Adhesive Dentistry**, v.6, n. 2, p. 111-5, jul. 2004.

TEDESCO, T. K. et al. Starch tubing: an alternative method to build up microshear bond test specimens. **The Journal of Adhesive Dentistry**, v. 15, n. 4, p. 311–5, ago. 2013.

TEDESCO, T. K. et al. Effect of cariogenic challenge on bond strength of adhesive systems to sound and demineralized primary and permanent enamel. **The Journal of Adhesive Dentistry**, v. 16, n. 5, p. 421–8, out. 2014.

TEN CATE, J. M.; DUIJSTERS, P. P. Alternating demineralization and remineralization of artificial enamel lesions. **Caries Research**, v. 16, n. 3, p. 201–2010, 1982.

TORII, Y. et al. Effect of phosphoric acid etching prior to self-etching primer application on adhesion of resin composite to enamel and dentin. **American Journal of Dentistry**, v. 15, n. 5, p. 305–8, out. 2002.

VAN LANDUYT, K. L. et al. Systematic review of the chemical composition of contemporary dental adhesives. **Biomaterials**, v. 28, n. 26, p. 3757–85, set. 2007.

VAN MEERBEEK, B. et al. Buonocore memorial lecture. Adhesion to enamel and dentin: current status and future challenges. **Operative Dentistry**, v. 28, n. 3, p. 215–35, maio 2003.

VAN MEERBEEK, B. et al. State of the art of self-etch adhesives. **Dental Materials**, v. 27, n. 1, p. 17–28, jan. 2011.

VINAGRE, A. et al. Microtensile Bond Strength and Micromorphology of Bur-cut Enamel Using Five Adhesive Systems. **The Journal of Adhesive Dentistry**, 2015. In press

WAGNER, A. et al. Bonding performance of universal adhesives in different etching modes. **Journal of Dentistry**, v. 42, n. 7, p. 800–7, jul. 2014.

WILSON, P. R.; BEYNON, A. D. Mineralization differences between human deciduous and permanent enamel measured by quantitative microradiography. **Archives of oral biology**, v. 34, n. 2, p. 85–8, jan. 1989.

YOSHIDA, Y. et al. Comparative Study on Adhesive Performance of Functional Monomers. **Journal of Dental Research**, v. 83, n. 6, p. 454–458, jun. 2004.

Anexo A – Carta de submissão e aprovação pelo Comitê de Ética em Pesquisa

UNIVERSIDADE FEDERAL DE SANTA MARIA/ PRÓ-REITORIA DE PÓS-GRADUAÇÃO E

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Comparação da resistência de união de sistemas adesivos
Pesquisador: Rachel de Oliveira Rocha
Área Temática:
Versão: 1
CAAE: 36765714.3.0000.5346
Instituição Proponente: Universidade Federal de Santa Maria/ Pró-Reitoria de Pós-Graduação e
Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 832.891
Data da Relatoria: 14/10/2014

Apresentação do Projeto:
Estudo laboratorial com o uso de dentes humanos fornecidos por Banco de Dentes
Com a constante busca pela realização de procedimentos conservadores e simplificados, diferentes materiais restauradores que permitem adequada adesão aos substratos dentários hígidos e cariados tem sido estudados. Apesar da crescente incorporação de novos sistemas adesivos ao mercado, existem poucos estudos que avaliam o comportamento destes materiais nos diferentes substratos de dentes decíduos e permanentes.

Desta maneira, o objetivo deste projeto é avaliar in vitro a resistência de união de 3 diferentes sistemas adesivos (Adper Single Bond 2, Clearfil SE Bond e Single Bond Universal) aos substratos esmalte e dentina de dentes decíduos e permanentes, nas condições hígidos ou alterados por lesões de cárie, por meio dos testes de microcisalhamento e microtração.

Numa próxima submissão convém explicar como se delimita o n.

Objetivo da Pesquisa:
Objetivo: avaliar a resistência de união do sistema adesivo Single Bond Universal ao esmalte e dentina, hígidos ou alterados por lesão de cárie, decídua e permanente quando comparado a

Endereço: Av. Roraima, 1000 - prédio da Reitoria - 2º ander
Bairro: Camobi **CEP:** 97.105-970
UF: RS **Município:** SANTA MARIA
Telefone: (55)3220-9362 **E-mail:** cep.ufsm@gmail.com

sistemas adesivos considerados como controle.

Avaliação dos Riscos e Benefícios:
Riscos: não estão previstos riscos aos doadores dos dentes salvo se houver quebra do sigilo das informações fornecidas previamente aos Bancos de Dentes fornecedores dos dentes para a pesquisa.

Benefícios: não estão previstos benefícios diretos aos doadores dos dentes mas sim aqueles decorrentes do conhecimento gerado pela pesquisa.

Comentários e Considerações sobre a Pesquisa:

.

Considerações sobre os Termos de apresentação obrigatória:
Presentes e adequados.

Recomendações:
Acesse ao novo site do CEP - http://coral.ufsm.br/cep - e, na aba "Orientações gerais", encontre modelos para apresentação de documentos.

Conclusões ou Pendências e Lista de Inadequações:

.

Situação do Parecer:
Aprovado

Necessita Apreciação da CONEP:
Não

UNIVERSIDADE FEDERAL DE SANTA MARIA/ PRÓ-REITORIA DE PÓS-GRADUAÇÃO E

Continuação do Parecer: 832.091

SANTA MARIA, 15 de Outubro de 2014

Assinado por:
CLAUDEMIR DE QUADROS
(Coordenador)

Endereço: Av. Roraima, 1000 - prédio da Reitoria - 2º andar
Bairro: Camobi CEP: 97.105-970
UF: RS Município: SANTA MARIA
Telefone: (55)3220-9362 E-mail: cep.ufsm@gmail.com

Anexo B – Normas para publicação no periódico Journal of Adhesive Dentistry

The Journal of Adhesive Dentistry

GUIDELINES FOR AUTHORS

The Journal of Adhesive Dentistry is a bi-monthly journal that publishes scientifically sound articles of interest to practitioners and researchers in the field of adhesion to hard and soft dental tissues. The Journal publishes several types of peer-reviewed original articles:

1. ***Clinical and basic science research reports*** – based on original research in adhesive dentistry and related topics.
2. ***Reviews topics*** – on topics related to adhesive dentistry
3. ***Short communications*** – of original research in adhesive dentistry and related topics. Max. 4 printed pages, including figures and references (max. characters 18,000). High priority will be given to the review of these papers to speed publication.

4a. ***Invited focus articles*** – presenting a position or hypothesis on a basic science or clinical subject of relevant related topics. These articles are not intended for the presentation of original results, and the authors of the articles are selected by the Editorial Board.

4b. ***Invited commentaries*** – critiquing a focus article by addressing the strong and weak points of the focus article. These are selected by the Editorial Board in consultation with the focus article author, and the focus article and the commentaries on it are published in sequence in the same issue of the Journal.

5. ***Invited guest editorials*** – may periodically be solicited by the Editorial Board.
6. ***Proceedings of symposia, workshops, or conferences*** – covering topics of relevance to adhesive dentistry and related topics.
7. ***Letters to the Editor*** – may be submitted to the editor-in-chief; these should normally be no more than 500 words in length.

SUBMISSION INSTRUCTIONS

Submission of manuscripts in order of preference:

1. Submission via online submission service (www.manuscriptmanager.com/jadd). Manuscript texts should be uploaded as PC-word files with tables and figures preferably embedded within the PC-word document. A broad range of file formats are acceptable. No paper version required but high resolution photographs or illustrations should be sent to the editorial office (see below). Online submissions are automatically uploaded into the editorial office's reviewer assignment schedule and are therefore processed immediately upon upload.
2. Submission via e-mail as a PC-word document (wintonowycz@quintessenz.de). Illustrations can be attached in any format that can be opened using Adobe Photoshop, (TIF, GIF, JPG, PSD, EPS etc.) or as Microsoft PowerPoint Documents (ppt). No paper version required but high resolution photographs or illustrations should be sent to the editorial office.
3. One paper copy of the manuscript plus a floppy diskette or CD-ROM (mandatory) containing a PC-word file of the manuscript text, tables and legends. Figures should be included on the disk if possible in any format that can to be opened using Adobe Photoshop, (Tif, Gif, JPG, PSD, EPS etc.) or as a Microsoft PowerPoint Document (ppt)

Mailing address:
Quintessenz Verlags-GmbH, Karin Wintonowycz
The Journal of Adhesive Dentistry,
Ifenpfad 2-4, D-12107 Berlin, Germany

Illustrations that cannot be sent electronically will be scanned at the editorial office so that they can be sent to reviewers via e-mail along with the manuscript to expedite the evaluation process.
Resubmitted manuscripts should also be submitted in the above manner. Please note that supplying electronic versions of your tables and illustrations upon resubmission will assure a faster publication time if the manuscript is accepted.

Review/editing of manuscripts. Manuscripts will be reviewed by the editor-in-chief and at least two reviewers with expertise within the scope of the article. The publisher reserves the right to edit accepted manuscripts to fit the space available and to ensure conciseness, clarity, and stylistic consistency, subject to the author's final approval.
Adherence to guidelines. Manuscripts that are not prepared in accordance with these guidelines will be returned to the author before review.

MANUSCRIPT PREPARATION

- The Journal will follow as much as possible the recommendations of the International Committee of Medical Journal Editors (Vancouver Group) in regard to preparation of manuscripts and authorship (Uniform requirements for manuscripts submitted to biomedical journals. Ann Intern Med 1997;126: 36-47).
- **Title page.** The first page should include the title of the article (descriptive but as concise as possible) and the name, degrees, job title, professional affiliation, contribution to the paper (e.g., idea, hypothesis, experimental design, performed the experiments in partial fulfillment of requirements for a degree, wrote the manuscript, proofread the manuscript, performed a certain test, consulted on and performed statistical evaluation, contributed substantially to discussion, etc.) and full address of all authors. Phone, fax, and e-mail address must also be provided for the corresponding author, who will be assumed to be the first listed author unless otherwise noted. If the paper was presented before an organized group, the name of the organization, location, and date should be included.
- **3-8 keywords.**
- **Structured abstract.** Include a maximum 250-word structured abstract (with headings *Purpose, Materials and Methods, Results, Conclusion*).
- **Introduction.** Summarize the rationale and purpose of the study, giving only pertinent references. Clearly state the working hypothesis.
- **Materials and Methods.** Present materials and methods in sufficient detail to allow confirmation of the observations. Published methods should be referenced and discussed only briefly, unless modifications have been made. Indicate the statistical methods used, if applicable.
- **Results.** Present results in a logical sequence in the text, tables, and illustrations. Do not repeat in the text all the data in the tables or illustrations; emphasize only important observations.
- **Discussion.** Emphasize the new and important aspects of the study and the conclusions that follow from them. Do not repeat in detail data or other material given in the Introduction or Results section. Relate observations to other relevant studies and point out the implications of the findings and their limitations.
- **Acknowledgments.** Acknowledge persons who have made substantive contributions to the study. Specify grant or other financial support, citing the name of the supporting organization and grant number.
- **Abbreviations.** The full term for which an abbreviation stands should precede its first use in the text unless it is a standard unit of measurement.
- **Trade names.** Generic terms are to be used whenever possible, but trade names and manufacturer should be included parenthetically at first mention.
- **Clinical Relevance.** Please include a very brief (2 sentences or 3 lines) clinical relevance statement.

REFERENCES

- **All references must be cited** in the text, according to the alphabetical and numerical reference list.
- **The reference list** should appear at the end of the article, in alphabetical and numerical sequence.
- **Do not include unpublished data** or personal communications in the reference list. Cite such references parenthetically in the text and include a date.
- **Avoid using abstracts** as references.
- **Provide complete information** for each reference, including names of all authors. If the reference is part of a book, also include title of the chapter and names of the book's editor(s).

Journal reference style:

1. Turp JC, Kowalski CJ, Stohler CS. Treatment- seeking patters of facial pain patients: Many possibilities, limited satisfaction. J Orofacial Pain 1998;12:61-66.

Book reference style:

1. Hannam AG, Langenbach GEJ, Peck CC. Computer simulations of jaw biomechanics. In: McNeill C (ed). Science and Practice of Occlusion. Chicago: Quintessence, 1997:187-194.

ILLUSTRATIONS

- All illustrations must be numbered and cited in the text in order of appearance.
- Submitted figures should meet the following minimum requirements:
  - High-resolution images should have a width of 83 mm and 300 dpi (for column size).
  - Graphics (bar diagrams, schematic representations, drawings) wherever possible should be produced in Adobe Illustrator and saved as AI or EPS files.
  - All figures and graphics should be separate files – not embedded in Word or Power Point documents.

Upon article acceptance, high-resolution digital image files must be sent via one of the following ways:

1. As an e-mail attachment, if the files are not excessively large (not more than 10 MB), to our production department: Steinbrueck@quintessenz.de
2. Online File Exchange Tool: Please send your figures with our Online File Exchange Tool. This web tool allows you to upload large files (< 350.0 MB) to our server. Please archive your figures with a maximum size of 350 MB first. Then upload these archives with the following link: http://files.qvnet.de/JAD/, password: JAD. Please name the archive with your name and article number so we can identify the figures.

Line drawings–Figures, charts, and graphs should be professionally drawn and lettered large enough to be read after reduction. Good-quality computer-generated laser prints are acceptable (no photocopies); also provide electronic files (eps, ai) if possible. Lines within graphs should be of a single weight unless special emphasis is needed.
Legends–Figure legends should be grouped on a separate sheet and typed double-spaced.

TABLES

- Each table should be logically organized, on a separate sheet, and numbered consecutively.
- The title and footnotes should be typed on the same sheet as the table.

MANDATORY SUBMISSION FORM

The Mandatory Submission Form, signed by all authors, must accompany all submitted
manuscripts before they can be reviewed for publication. Electronic submission: scan the signed form and submit as JPG or TIF file.

PERMISSIONS & WAIVERS

- Permission of author and publisher must be obtained for the direct use of material (text, photos, drawings) under copyright that does not belong to the author.
- Waivers must be obtained for photographs showing persons. When such waivers are not supplied, faces will be masked to prevent identification. For clinical studies the approval of the ethics committee must be presented.

PAGE CHARGE

The first 8 printed pages in an article are free of charge. For excess pages, the charge is €140 per printed page. The approximate number of characters on a printed page is approximately 6,800. Please also consider the number and size of illustrations.

The Journal of
Adhesive Dentistry

MANDATORY SUBMISSION FORM

Title of article: _____

A signature below certifies compliance with the following statements:

Copyright transfer. In consideration of the acceptance of the above work for publication, I do hereby assign and transfer to Quintessence Publishing Company all rights, title, interest in and copyright to the above-titled work. This assignment applies to all translations of said article as well as to preliminary display/posting of the abstract of the accepted article in electronic form before publication. If any changes in authorship (order, deletions, or additions) occur after the manuscript is submitted, agreement by all authors for such changes must be on file with the Publisher. An author's name may be removed only at his/her request. (Note: material prepared by employees of the US Government in the course of their official duties cannot be copyrighted.)

Author responsibilities. I attest that:
The manuscript is original work without fabrication, plagiarism, or fraud;
The manuscript is not currently under consideration elsewhere and the research reported will not be submitted for publication elsewhere unless a final decision is made by the Journal that the manuscript is not acceptable;
I have made a significant scientific contribution to the study and I am thoroughly familiar with the primary data outlined in the manuscript;
I have read the complete manuscript and take responsibility for the content and completeness of the final submitted manuscript and understand that if the manuscript, or part of the manuscript, is found to be faulty or fraudulent, I share responsibility.

Conflict of interest disclosure. All institutional or corporate affiliations of mine and all funding sources supporting the work are acknowledged. Except as disclosed in the separate enclosed letter, I certify that I have no commercial associations (eg, consultancies, patent-licensing arrangements, equity interests) that might represent a conflict of interest in connection with the submitted manuscript (letter attached).

Experimental procedures in humans and animals. The Journal endorses the principles embodied in the Declaration of Helsinki and insists that all investigations involving human beings reported in articles in the Journal be carried out in conformity with these principles and with similar principles such as those of the American Physiological Society, eg, see J Neurophysiol 1997;78(6). In the case of animal experiments reported in the Journal, these should also conform to these latter principles or with analogous principles such as those of the Canadian Council on Animal Care or The International Association for the Study of Pain. In articles reporting experiments involving surgical procedures on animals, the type and dosage of anesthetic agent used must be specified in the Materials and Methods section, and evidence must be provided that anesthesia of suitable grade and duration was achieved. Authors reporting on their experimental work in humans or animals should also cite evidence in the Materials and Methods section of the article that this work has been approved by, respectively, an institutional clinical/human experimentation panel or an institutional animal care and use panel (or equivalent). The editor-in-chief and associate editors are expected to refuse articles in which there is no clear evidence that these principles have been adhered to, and they reserve the right to judge the appropriateness of the use of human beings and animals in experiments reported in articles submitted to the Journal.

Signature of each author required in the same order as on the manuscript title page (Fax signatures, multiple forms are acceptable). For more than 5 authors, use an extra sheet.

Signature (1) _____ Print name _____ Date _____

Signature (2) _____ Print name _____ Date _____

Signature (3) _____ Print name _____ Date _____

Signature (4) _____ Print name _____ Date _____

Signature (5) _____ Print name _____ Date _____

Corresponding author _____ **Mailing address** _____

Phone _____ _____

Fax _____ _____

E-mail _____ _____