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NÍVEL MESTRADO

RESISTÊNCIA DE UNIÃO EM DIFERENTES SISTEMAS ADESIVOS EM DENTES DECÍDUOS ERODIDOS

NICOLE MARCHIORO DOS SANTOS

Porto Alegre

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LINHA DE PESQUISA: Biomateriais e Técnicas Terapêuticas em Odontologia

RESISTÊNCIA DE UNIÃO EM DENTES DECÍDUOS ERODIDOS

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Orientador: Prof. Dr. Jonas de Almeida Rodrigues

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SUMÁRIO

RESUMO

O objetivo deste estudo foi avaliar a resistência de união (RU) do esmalte e da dentina decídua após desafio erosivo utilizando sistemas adesivos convencionais e autocondicionantes. Noventa e seis molares decíduos foram seccionados mesio-distalmente para obtenção de blocos de esmalte, foram embebidos em resina epóxi e polidos com lixas de carbeto de silício (600, 1200, 2400 e 4000). As amostras foram randomizadas e divididas entre os 4 sistemas adesivos utilizados: SB (Adper Single Bond 2), SBU (Single Bond Universal), OBFL (Optibond FL) e BF (Bond Force). Metade das amostras (grupo teste, n=48) foram submetidas a desafio erosivo/abrasivo (50 mL de Coca-Cola®, pH 2,6, 1 min, 4x ao dia, 5 dias, seguido de escovação por 1 min com dentifrício fluoretado, NaF 1450 ppm e saliva artificial). A outra metade dos blocos (grupo controle) foi mantida imersa em saliva artificial. Em seguida foram realizadas restaurações de resina flow (Tetric Flow) utilizando matrizes de polivinil siloxano com diâmetro de 0,9mm e 1mm de altura. As amostras foram colocadas na máquina de ensaio universal e foi aplicada força de cisalhamento com velocidade de 1,0mm/min até que a fratura ocorresse. Os mesmos blocos tiveram suas superfícies de dentina expostas, em seguida, as mesmas etapas foram realizadas (restaurações e RU). Foram utilizados os testes ANOVA de duas vias e Tukey (p=0,05). No esmalte, os grupos teste e controle não apresentaram diferença estatística, independentemente dos sistemas adesivos utilizados. Na dentina, o BF apresentou melhores valores de no grupo teste (p=0,04). O fator adesivo foi significativo na análise fatorial (p<0,001) assim como a interação entre desafio erosivo/abrasivo e os sistema adesivo utilizado (p=0,046). Somente o substrato dentinário teve influência significativa na RU (p=0,395). Conclui-se que a RU ao esmalte decíduo não foi afetada pelo desafio erosivo/abrasivo para todos os sistemas adesivos utilizados, enquanto a RU na dentina decídua somente foi afetada pelo sistema adesivo autocondicionante contendo flúor.

Palavras chave: Erosão dentária, Sistemas adesivos, Dente decíduo

1.**INTRODUÇÃO**

A diminuição da prevalência da doença cárie nos últimos anos provocou um evidente aumento no número de dentes decíduos em boca na população mundial, possibilitando, assim, a maior ocorrência do desgaste dentário erosivo e o seu consequente diagnóstico (1). Diante disso, as pesquisas têm evoluído no sentido de compreender melhor tal ocorrência.

O desgaste dentário erosivo tem sido definido como a perda de tecido dentário duro pela exposição a ácidos (extrínsecos ou intrínsecos) sem a presença de bactérias (2-4). Além disso, sua severidade pode ser modificada pela qualidade e quantidade de saliva (5). Tais ácidos estão presentes na dieta ou são oriundos do estômago, nos casos de regurgitações e refluxos (6). Esse tipo de desgaste é um processo irreversível cujos fatores etiológicos devem ser identificados e controlados para evitar a progressão desta ocorrência (7).

A exposição ácida faz com que haja um amolecimento da superfície dentária envolvida e quando presente por um tempo longo alterações clinicas podem ser identificadas (8). Primeiramente, ocorre a dissolução do esmalte e se o desafio erosivo continua ocorre a perda de substância pelo amolecimento progressivo do esmalte dentário (9). Essa camada amolecida é mais suscetível a forças mecânicas como abrasão e atrição (9-13). Mais frequentes são os casos nos quais o desgaste erosivo atinge o esmalte dentário, porém se os fatores etiológicos não forem controlados este desgaste progride e em casos mais avançados atinge o tecido dentinário (14), levando à perda de dimensão vertical, ou ainda à sensibilidade dentinária (9).

Fatores biológicos e químicos presentes na cavidade bucal influenciam na progressão do desgaste dentário erosivo (15). A saliva tem um papel importante nesta proteção, diluindo, limpando e neutralizando os ácidos provenientes da dieta, formando uma camada de película adquirida (camada protetora cobrindo a superfície dentária), além de ser fonte de íons inorgânicos necessários para o processo de remineralização (16-17).

Produtos fluoretados como dentifrícios e enxaguatórios bucais têm sido utilizados para prevenir o desgaste dentário erosivo (18). Há na literatura uma vasta quantidade de produtos estudados com as mais diversas concentrações e componentes e até o momento não existe um produto ideal para prevenção do desgaste dentário causado pela erosão (7,13,15, 18-22).

Uma vez diagnosticado o desgaste dentário erosivo, pode ser necessária à realização de procedimentos restauradores para o restabelecimento da dimensão vertical de oclusão, da função e da estética dos dentes decíduos (24). Desta forma, se faz necessário o conhecimento das propriedades dos materiais adesivos e seu comportamento frente aos diferentes substratos após desafios erosivos.

A tecnologia dos materiais adesivos evoluiu rápido nos últimos 50 anos, quando esses materiais foram introduzidos na odontologia. O grande desafio para os sistemas adesivos é conseguir uma adesão igualmente efetiva nos diferentes tecidos dentários (25). Hoje em dia os adesivos são classificados de acordo com a maneira que interagem com a lama dentinária em convencionais e autocondicionantes, e eles diferem na maneira como interagem com o tecido dentário (25-26). Os sistemas adesivos são categorizados em quatro classes principais (convencionais de 3 passos, convencionais de 2 passos, autocondicionantes de 2 passos e autocondicionantes de 1 passo) e todos eles são responsáveis pela união da resina composta ao tecido dentário (27).

A efetividade da união dos sistemas adesivos frequentemente é testada em esmalte e dentina hígidos através de estudos laboratoriais. Tais estudos mostram uma grande variação de sucesso entre as diferentes classes de adesivos e mesmo entre diferentes marcas da mesma classe (28-30). Estudos tem sugerido que uma força de adesão entre 17-20 Mpa de cisalhamento deve ser atingida em dentes permanentes para compensar o estresse causado durante a contração de polimerização (31-32). Apesar de não ter um valor conhecido para a dentição decídua, pode ser postulado que valores um pouco mais baixos são aceitáveis (33).

Alguns estudos mostram certa preocupação no que diz respeito à adesão de substrato dentário previamente exposto a desafios mecânicos e/ou químicos, tais como clareamento externo e desafio erosivo (34). Poucos foram os estudos que investigaram a efetividade da adesão em dentes decíduos (35-37). Como existe um amolecimento da superfície dentária durante o desafio erosivo alguns estudos mostraram que a adesão nesse substrato foi afetada negativamente (38-41). Estudos que realizaram desafio erosivo/abrasivo também mostraram valores diminuídos para a adesão em esmalte (34,40). No entanto, esse efeito prejudicial da erosão na adesão não foi observado por outros autores (42-44).

Diversos estudos de prevalência vem sendo realizados, a prevalência de erosão em pré-escolares e escolares varia de acordo com a região estudada e hábitos dietéticos da população em estudo. Além disso, a prevalência de erosão em crianças é afetada pel idade, uma vez que a lesão causada pela erosão torna-se mais fácil de ser detectada com a exposição crescente dos dentes aos ácidos (24). Mundialmente a prevalência de erosão na dentição decídua varia de 12,3% em crianças 6-12 anos no Brasil a 70,6% em crianças de 8-14 anos na Alemanha (45,46)

A ocorrência de erosão dentária na dentição decídua, apesar de ser um tema emergente nas pesquisas, tem aspectos pouco explorados em pesquisas, principalmente quanto às propriedades dos materiais restauradores frente ao desafio erosivo/abrasivo. Consequentemente, a influência de diferentes tipos de adesivos sobre a adesão ao esmalte e dentina decíduos erodidos deve ser testada. Além disso, a presença de fluoreto em adesivos e uma possível interação com o tecido erodido devem ser investigadas.

1. OBJETIVOS

O objetivo deste estudo foi avaliar a resistência de união (RU) de sistemas adesivos convencionais e autocondicionantes contendo ou não flúor ao esmalte e dentina decídua através do teste de microcisalhamento após desafio erosivo/abrasivo utilizando sistemas adesivos convencionais e autocondicionantes, contendo ou não flúor.

As hipóteses nulas testadas foram que o desafio erosivo/abrasivo não afeta a RU em dentes decíduos e que os sistemas adesivos convencionais e autocondicionantes afetam de maneira similar a RU em dentes decíduos.

2. ARTIGO

Microshear bond strength of self-etch and etch-and-rinse adhesives to eroded primary teeth

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Clinical relevance: Erosive tooth wear (ETW) has gained in importance over the last few decades, and its prevalence in children is also increasing. Owing to the loss of substance, tooth sensitivity, altered aesthetics and loss of occlusal vertical dimension caused by ETW, restorative treatment may be indicated. Despite the need of restorative treatment, there have been few studies concerning the behavior of dental materials on eroded primary teeth. Consequently, our study investigated the bond strength of self-etch and etch-and-rinse adhesives to eroded primary enamel and dentin.

Abstract: The aim of this *in vitro* study was to evaluate the microshear bond strength of four adhesive systems on eroded or sound primary teeth. Methods: Ninety-six primary molars were cut mesio-distally, embedded, ground and polished with SiC papers (600, 1200, 2400 and 4000). Specimens were randomly divided according to 4 adhesive systems: SB (Adper Single Bond2®), SBU (Universal Single Bond®), OBFL (OptibondFL®) and BF (BondForce®). Half of the specimens were exposed to erosive/abrasive challenge, and the other half (control group; n=48) remained immersed in artificial saliva. Erosive challenge consisted of specimen immersion in Coca-Cola® (pH 2.6, 50ml, 1min, 4x, 5 days). Once a day, the specimens were brushed using an electric toothbrush with a slurry (artificial saliva and NaF toothpaste, 1450 ppm) for 1 minute. Polyvinyl siloxane molds with a perforation 0.9 mm in diameter and 1 mm in height were placed over the specimens in order to build restorations with flowable resin composite. The molds were cut with surgical blades and removed to allow for microshear bond strength testing. Bonded specimens were attached to an universal testing machine and a shear load was applied with a steel wire at a crosshead speed of 1.0 mm/min until failure occurred. After the tests in enamel, dentin was exposed and polished to perform the same tests in this substrate. Two-way

ANOVA and Tukey tests were performed (p=0.05). Results: No statistically significant difference was found between the eroded and sound enamel for any of the adhesives. BF was statistically significant better in eroded dentin than sound dentin (p=0.04). A factorial analysis indicated that the factor adhesive was significant (p<0.001) as was the interaction between adhesive and erosive tooth wear (p=0.046). Only the dentin substrate had a significant influence on microshear bond strength (p=0.395). Conclusion: Bond strength to primary enamel was not affected by erosive/abrasive challenge for all the adhesives systems, while in primary dentin the bond strength was affected only after the use of self-etch adhesive containing fluoride.

Key-words: Erosive tooth wear, primary teeth, bond strength.

Introduction

Erosive tooth wear (ETW) is defined as the loss of mineral content from tooth structure through a chemical process without bacterial influence. There is a continuous dissolution of enamel crystals, layer by layer, leading to a loss of tooth volume and a softened tissue surface.[1] The prevalence of ETW is increasing steadily in populations owing to the enlarging consumption of citrus fruits, soft drinks, acidic food, as well as the presence of gastroesophageal disorders.[2] ETW prevalence in children has been reported to range from 10% to 82%. And it gets higher with age, once the longer the tooth stay in mouth more susceptible is to ETW.[3]

Children presenting ETW may need restorative procedures owing to associated caries lesions, extensive loss of tooth structure, hypersensitivity, trauma or other related factors.[4] Despite that, there is an absence of studies investigating the bonding of adhesive systems to eroded primary teeth. Regarding permanent dentition, adhesion to eroded substrate has been affected in previous studies because there is a softened surface interacting with the adhesive system.[5,6] However, the detrimental effect of erosion on adhesion has not been observed by other authors.[7]

Clinician and researcher interest in fluoride-releasing materials is growing. Adhesive systems that release fluoride have been used with the purpose of contributing to secondary caries prevention[8,9,10]. However the formation of an acid-resistant tissue around cavity walls and margins has been observed in some studies[11,12]. Also, the influence of fluoride-releasing adhesives on adhesion to eroded substrates is still unclear.

Consequently, the influence of different adhesive systems on adhesion to eroded primary teeth must be tested. Also, the presence of fluoride and a possible interaction with the eroded tissue must be investigated. Thus, the aim of this in vitro study was to evaluate the microshear bond strength of four adhesive systems to eroded and sound primary enamel and dentin. The null hypothesis tested was that neither type of substrate nor adhesive systems affects bond strength.

Materials and methods

The protocol of this study was approved by the local ethics committee. Ninety-six exfoliated primary molars stored in distilled water at 4ºC were used in this study. Teeth were partially embedded in self-curing epoxy resin inside PVC cylindrical molds. Enamel surfaces were ground with 600, 1200, 2400 and 4000 grit SiC papers to produce a standard flat and polished enamel surface. Knoop microhardness was measured and teeth with hardness values outside the standard deviation were replaced (enamel: 378.8±29.0; dentin: 63.1±1.4).

For the experimental tests specimens were randomly allocated to 8 experimental groups (n=12) according to the type of substrate (eroded and sound) and adhesive system (self-etch and etch-and-rinse, containing or not fluoride). Groups were defined by eroded (test) or sound (control) and by one of the four types of adhesives (etch and rinse with fluoride, OptiBond FL®; etch and rinse without fluoride, Adper Single Bond 2®; self-etch with fluoride, Bond Force®; and self-etch without fluoride, Universal Single Bond®). The erosive/abrasive challenge consisted of three pH-cycles for 5 days. Specimens were immersed in a container with a freshly opened Coca-Cola® (pH 2.6, Coca-Cola Company) for 3 minutes under mechanical agitation. After the last pH-cycle of the day, specimens' surfaces were exposed to an abrasive challenge consisting of brushing with an electric toothbrush (Bitufo - São Paulo, Brazil) and an artificial saliva/toothpaste (1450 ppm F – Colgate total 12) slurry for 1 minute. Specimens were stored in artificial saliva throughout the erosion challenge, the saliva was changed everyday[13]. Then, specimens were washed with distilled water and stored for adhesive procedures. In order to analyze the effect of the erosive/abrasive challenge on enamel surfaces, a microhardness test was performed on

12 random specimens. An average reduction in enamel microhardness of 30% was observed after the erosion challenge for all tested specimens.

The adhesive systems were applied on enamel surfaces in accordance with the manufacturer's instructions (Table 1). Polyvinyl siloxane molds with a perforation 0.9 mm in diameter and 1 mm in height were placed over the specimens to build flowable composite resin cilinders. Flowable resin composite (Tetric N'Ceram A3 – Ivoclar, Schaan, Lichtenstein) was inserted into the molds and light cured for 20 seconds with an LED device (Biolux Plus 1000 mW/cm² - São Carlos, Brazil). The molds were then cut with surgical blades and removed. The adhesive procedures were carried out by a single trained operator at room temperature.

The bonded specimens were attached to a universal testing machine (Instron 5969 – Instron, Norwood, USA) and a shear load was applied with a thin steel wire (0.2 mm diameter) at a crosshead speed of 1.0 mm/min until failure occurred. Care was taken to keep the wire at the enamel resin interface and the force application parallel to the bonded surface. The microshear bond strength was calculated and expressed in MPa. For specimens that failed prematurely, the microshear bond strength was considered 0 MPa (in total 3 specimens).

Enamel specimens were ground with 600, 1200, 2400 and 4000 grit SiC papers until dentin tissue had been reached and to produce a standard flat and polished dentin surface. Dentin specimens selection through microhardness analyzes, erosive/abrasive challenge, restoration procedures and microshear bond strength test were performed as described for enamel specimens.

Bond strength mean values for both enamel and dentin specimens were calculated for each group and a normal data distribution was assumed after a Kolmogorov–Smirnov test. Data were analyzed using two-way ANOVA (type of substrate vs. adhesive system) and Tukey's *post hoc* test at a significance level of 95%. Statistical analysis was performed using SPSS Statistics software version 21.0 (IBM, New York, USA).

Results

Table 2 shows the two-way ANOVA results. For both substrates bond strength was significantly affected ($p<0.001$) by the adhesive system as well as the interaction between adhesive system and erosive/abrasive challenge (enamel $p=0.046$ and dentin $p=0.001$).

According to the factorial analysis, type of substrate did not influence microshear bond strength in enamel (p=0.395) and in dentin (p=0.528).

Microshear bond strength means and standard deviations (MPa) for all experimental enamel and dentin specimens are shown in Table 3. No statistical difference was found among eroded and sound enamel bond strength values for all the adhesives systems. In dentin, BF was the only adhesive system that showed statistically significant difference on bond strength values (p=0.04) when eroded and sound groups were compared.

Discussion

To the authors' knowledge, this is the first study testing the adhesion of different adhesive systems to eroded primary teeth. The results show that for none of the four adhesive systems investigated the bond strength to eroded primary enamel was statistically lower than to sound primary enamel. However, for dentin, bond strength values were higher in the test group only for BF. Other adhesive systems had the same behavior in dentin as observed in enamel, without differences between sound and eroded dentin. On the other hand, bond strength was affected by the adhesive system in both substrates. Thus, for the enamel, the null hypothesis was partially rejected. However for dentin the null hypothesis was completely rejected.

An interaction was observed between adhesive system and type of substrate, providing evidence that self-etch adhesives may have the adhesion improved by the eroded substrate. This behavior could be expected because of an erosion effect similar to that of acid etching[14]. This surface alteration may increase the mechanical retention and improve the performance of self-etching adhesives in bonding to enamel. *In vitro* and *in vivo* studies have already reported improved bond strength of self-etch adhesives to previously etched enamel.[15,16] Self-etch adhesives had higher bond strength to eroded primary dentin than etch-and-rinse adhesives, being these findings in accordance with Zimmerli et al, 2012. This could be due to the erosion process in dentin that can increase tubule diameter and collagen exposure, once dentinal plugs and organic intertubular dentin are removed[18]. This process may interfere in the adhesives systems properties. Another explanation for this fact can be that the mineral content in dentin may be not as essential as it is for the enamel when using etch-and-rinse adhesives systems[7].

Bond strength of different adhesive systems to primary sound teeth has previously been reported[19-21]. However, the effect of eroded substrate on adhesion is still unclear. The present study is the first report of a bond strength test comparing eroded to sound primary enamel and dentin and different adhesive systems. Bond strength studies of primary teeth are fundamental since permanent and primary teeth present different characteristics that may lead to differences with respect to adhesion[22]. Previous studies have reported controversial results for eroded permanent enamel[15,23-24]. The results of some studies suggest that adhesion can be affected while other results suggest that erosion can improve bond strength.[6,24] Our results show that adhesion to primary enamel may not change if the substrate is eroded, and this is corroborated by the findings from other authors on permanent enamel.[23,25] It could be also noticed that BF had better performance in eroded than sound primary dentin, while all the others adhesives systems had a better performance on sound primary dentin. A possible explanation is that ultramild self-etch adhesive systems (pH>2,5) may be impaired by thick smear layers[26-27]. This could not have occurred to the SBU adhesive system that contains 10-MDP monomer in its composition. This monomer is responsible for a strong molecular interaction with hydroxyapatite cristals and it is known for promoting a stable chemical interaction with hydroxyapatite that is stronger than those from other functional monomers.[28]

Etch-and-rinse adhesives require a prior etching step with 35-37% phosphoric acid that may result in a demineralization of approximately 10 µm on permanent enamel.[29] The thickness of the softened layer caused by erosion has been reported to be between 0.2 and 3 µm.[30] Thus, when the etching step is performed during adhesive application, all the softened surface may be removed. For this reason, no erosion effect on adhesion would be expected for etch-and-rinse adhesives. The results from our study corroborate these findings.

With respect to eroded enamel, OBFL and SBU presented higher bond strength values than SB and BF. OBFL is a three-step etch-and-rinse adhesive and SB is a two-step etch-and-rinse adhesive. Data from clinical studies show superior performance over time for three-step etch-and-rinse adhesive systems compared to two-step etch-and-rinse adhesive systems.[31] In this study, there was no statistical differences between both adhesive systems for bond strength. Moreover, in long-term three-step adhesive systems are proven to degrade less and then perform better than the two-step.[32] Regarding self-etch adhesives, SBU is a multi-mode adhesive that also contains 10-MDP monomer. In our study, self-etch adhesive system containing 10-MDP performed better than the self-etch adhesive system containing different acidic monomer.

However, adhesion to permanent dentin appears to be more sensitive to erosion than does the adhesion to enamel. Several studies have reported a reduction in bond strength on eroded permanent dentin. These studies also show that additional surface treatment, such as laser irradiation[33], bur roughening[17] and even using mouth rinses containing Sn/F,[34] can increase bond strength to this eroded substrate. One interesting finding is that fluoride-containing adhesive systems have been shown to provide a protective effect against erosive and cariogenic challenges on dentin.[12,35] It is noteworthy that this protective effect occurs only on dentin adjacent to the adhesive.

Fluoride plays an important role in improving the acid resistance of dental tissues, and its preventive effect on ETW has been reported in previous studies. [13,36] However, in this study, an advantage from adhesives containing fluoride was not observed. This could be explained by the fact that the enamel and dentin were already eroded and that the restoration-adhesive interfaces did not receive any erosive challenge. Also, the amount of fluoride released from fluoride containing adhesives is normally not known and may not be high enough to help reduce demineralization under strong erosive challenges. The effect of fluoride inside the adhesive system on enamel and dentin could be further evaluated by providing an erosive challenge after bonding.

The self-etch adhesives, in general, had a good performance in enamel and in dentin after erosive/abrasive challenge. Self-etch adhesives are a good option to use in pediatric clinic once they have fewer clinical steps, and decreased clinical sensitivity.

Erosive protocols vary from one study to another.[6,7,24,25] In our study, an erosive/abrasive challenge using an acidic beverage was performed similar to that used in previous studies.[25,37] To check the effect of the protocol and confirm the presence of softened enamel and dentin, a surface microhardness test was performed. A reduction in enamel and dentin microhardness of 30% was observed as a result of the erosion challenge, indicating that the erosion protocol was indeed successful. Patients with ETW may present a challenge to adhesive restorative treatments owing to the softened substrate surface or strong pH variations caused by erosive challenges. However, eroded primary tooth was not detrimental to bond strength in the present study. Therefore, additional research should clarify if erosive challenges can affect the adhesive interfaces of already restored primary teeth.

Conclusion

Our study showed that not all adhesive systems behave in the same way in deciduous teeth that have undergone previous erosive / abrasive challenge. From this, it can be suggested that there is an interaction between the adhesive systems used and the erosive challenge influencing the bond strength and that the Universal Single Bond adhesive system can be indicated for restorations in deciduous teeth that have undergone erosive challenge.

Tables

Table 1. Adhesive systems and manufacturer's instructions.

Material	Brand (Manufacturer /Lot)	Composition	Application mode
Adper Single Bond 2 (SB)	3M ESPE (St. Paul, MN, USA / N2633976R)	Bis-GMA, HEMA, dimethacrylates, ethanol, water, methacrylate copolymers of polyacrylic and polyalkenoic acids (pH 4.1).	**1)** Etching with phosphoric acid 37.5% for 15 s. **2**) Washing with water for 10 s, removal of excess with cotton balls. **3)** Adhesive application, 3 layers for 15 s, gentle drying with air spray for 5 s. **4)** Light-curing for 10 s.
Single Bond Universal (SBU)	3M ESPE (St. Paul, MN, USA / 504834)	BIS-GMA, 2-hydroxyethyl methacrylate, ethyl alcohol, dimethacrylates, water, acrylic copolymer and itaconic acid, camphorquinone, N-dimethylbenzocaine (pH 2.7).	**1)** Adhesive application for 20 s, gentle drying with air spray for 5 s. **2)** Light-curing for 10 s
OptiBond FL (OBFL)	Kerr Corporation (Orange, CA, USA / 47788192)	*Primer:* HEMA, GPDM, PAMM, ethyl alcohol, butylated hydroxytoluene, camphorquinone, water (pH 1.9). *Adhesive:* Bis-GMA, HEMA, barium aluminum borosilicate, silica, di-sodium hexafluorosilicate 1-5%, glycerol dimethacrylate, camphorquinone (pH 6.9).	**1)** Etching with phosphoric acid 37.5% for 15 s. **2**) Washing with water for 15 s, gentle drying with air spray. **3)** Primer application for 15 s, gentle drying with air spray for 5 s. **4)** Adhesive application until a thick layer was formed, if necessary gentle drying with air spray. **5)** Light-curing for 10 s.
Bond Force (BF)	Tokuyama Dental Corporation (Tokyo, Japan / 091E92)	TEDGMA, phosphate monomer, camphorquinone, Adhesive SR (self-reinforcing) monomer, Polymerizing monomer (HEMA, Bis-GMA, 3G), water, alcohol, glass filler, photopolymerization catalyst (pH 2.8)	**1)** Adhesive application with friction against the walls of the cavity preparation for 20 s. **2)** Gentle drying with air spray for 5 s followed by a stronger air spray for 5 s. **3)** Light-curing for 10 s.

Table 2. Two-way ANOVA results.

	Enamel			Dentin		
	Df	**Mean Square**	**P value**	**Df**	**Mean Square**	**P value**
Adhesive	3	817.71	<0.001	3	494,785	<0,001
Erosion	1	24.74	0.395	1	10,487	0,528
Adhesive*Erosion	3	94.11	0.046	3	156,846	0,001

Table 3. Microshear bond strength means and standard deviations (MPa) for sound and eroded enamel and dentin specimens.

	Single Bond Universal	Bond Force	Single Bond	OptiBond FL
Sound enamel	15.67 (7.11)^{A,B}	3.10 (3.58)^{D}	12.82 (4.40)^{A,B,C}	18.22 (7.79)^{A}
Eroded enamel	19.55 (5.33)^{A}	7.90 (4.72)^{C,D}	9.43 (6.98)^{B,C,D}	16.98 (5.27)^{A}
Sound dentin	22.81(4,80)^{A}	7.01 (4,76)^{D}	15.91(4,15)^{B,C}	17.08(6,06)^{A,B,C}
Eroded dentin	21.43(4,83)^{A,B}	15.26(5,80)^{B,C}	14.63(5,22)^{C}	14.14(5,03)^{C}

*Groups with the same letters are not statistically significantly different.

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3. CONSIDERAÇÕES FINAIS

O desgaste dentário erosivo vem ganhando importância na prática odontológica e nas pesquisas nas últimas décadas, além disso, a prevalência em crianças vem aumentando, principalmente devido ao estilo de vida moderno. Devido à perda substancial de tecido dentário, sensibilidade e perda de dimensão vertical cresce também a necessidade de tratamento restaurador causada por essa doença.

Existem poucos estudos na literatura que avaliam a resistência de união entre tecido dentário decíduo e materiais adesivos. Nosso estudo mostrou que nem todos os sistemas adesivos se comportam da mesma maneira em dentes decíduos que sofreram desafio erosivo/abrasivo prévio. E a partir disso, pode-se sugerir que existe uma interação entre os sistemas adesivos utilizados e o desafio erosivo influenciando na resistência de união e que o sistema adesivo Single Bond Universal pode ser indicado para restaurações em dentes decíduos que sofreram desafio erosivo.

4. ANEXOS

Parecer Cosubstanciado do CEP

UNIVERSIDADE FEDERAL DO RIO GRANDE DO SUL / PRÓ-REITORIA DE PESQUISA -

PARECER CONSUBSTANCIADO DO CEP

DADOS DO PROJETO DE PESQUISA

Título da Pesquisa: Influência do desafio erosivo em dentes decíduos submetidos a procedimentos restauradores com diferentes protocolos adesivos - Estudo in vitro.

Pesquisador: Jonas de Almeida Rodrigues
Área Temática:
Versão: 3
CAAE: 15178113.3.0000.5347
Instituição Proponente: Universidade Federal do Rio Grande do Sul
Patrocinador Principal: Financiamento Próprio

DADOS DO PARECER

Número do Parecer: 327.244
Data da Relatoria: 27/06/2013

Apresentação do Projeto:
A projeto tem como tema a erosão dentária, que é definida como a perda de tecido dentário duro por um processo químico sem a influência de bactérias. Esta é causada por ácidos que podem ser extrínsecos, geralmente provenientes da dieta com ingestão de refrigerantes, sucos de frutas; ou intrínsecos, devido ao refluxo de ácido gástrico. Sua etiologia é complexa, e, além da ação de ácidos, estão associados também outros tipos de desgaste dos dentes, como o atrito ou abrasão. Atualmente, estudos epidemiológicos sugerem que ou a prevalência de erosão está aumentando ou há um aumento da consciência da doença, principalmente, em adultos jovens e adolescentes. A erosão dentária constitui-se um grande problema em saúde bucal, apresentando prevalência variando de 4-82% em adultos e de 10-80% em crianças. A ocorrência de erosão dentária na dentição decídua, apesar de ser um tema emergente nas

pesquisas
recentes, ainda tem aspectos pouco explorados em pesquisas, principalmente quanto às propriedades dos materiais restauradores frente ao desafio erosivo.

Objetivo da Pesquisa:

Objetivo Primário:

Avaliar as consequências de desafios erosivos em dentes decíduos restaurados com diferentes sistemas adesivos.

Objetivo Secundário:

Sub-projeto I: Avaliar a resistência de união de diferentes sistemas adesivos em dentes decíduos previamente submetidos a desafio erosivo. Avaliar a interface dente decíduo erodido - restauração através da rugosidade superficial, microscopia eletrônica de varredura (MEV), microscopia CONFOCAL e espectroscopia RAMAN. Sub-projeto II: Avaliar a microdureza longitudinal dos dentes decíduos restaurados com diferentes sistemas adesivos e submetidos a desafio erosivo. Avaliar a interface dente decíduo - restauração através da rugosidade superficial, microscopia eletrônica devarredura (MEV), microscopia CONFOCAL e espectroscopia RAMAN.

Avaliação dos Riscos e Benefícios:

Riscos e benefícios foram adequadamente apresentados.

Comentários e Considerações sobre a Pesquisa:

Estudo in vitro, através da realização de diferentes protocolos para confecção de restaurações, sendo as unidades experimentais 110 dentes decíduos, divididos aleatoriamente em três grupos. As variáveis de resposta serão: a resistência de união avaliada através do ensaio de cisalhamento; a perda mineral aferida através da microdureza longitudinal; e a rugosidade superficial avaliada através do rugosímetro, microscopia eletrônica de varredura (MEV), microscopia CONFOCAL e espectrometria RAMAN. O projeto está bem descrito e tem mérito científico.

Considerações sobre os Termos de apresentação obrigatória:

O TCLE foi incluído, portanto o projeto se encontra em condições de ser aprovado. Favor atentar para a data colocada no termo, a qual deve ser modificada para 2013. A título de esclarecimento, informamos que a recomendação é de que o termo seja lido para o indivíduo de pesquisa (ou responsável pelo mesmo especificamente no caso do presente projeto).

Recomendações:

Na medida em que o TCLE foi incluído, o parecer é pela aprovação do projeto.

Conclusões ou Pendências e Lista de Inadequações:

O projeto encontra-se em condições de ser aprovado.

Situação do Parecer:

Aprovado

Necessita Apreciação da CONEP:

Não

Considerações Finais a critério do CEP:

Encaminhe-se.

PORTO ALEGRE, 05 de Julho de 2013

Assinador por:
MARIA DA GRAÇA CORSO DA MOTTA (Coordenador)

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