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ARQUIVOS EM ODONTOLOGIA

The influence of prophylaxis with amino acid glycine powder and sodium bicarbonate jet on the bond strength of dental enamel

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Aim: To compare the influence of prophylaxis with sodium bicarbonate and amino acid glycine powder on the bond strength of bovine teeth enamel and on the properties of two adhesive systems.

Methods: Thirty-six extracted bovine incisors were randomly divided into six groups (n = 6) according to the prophylactic treatment received: no prophylactic treatment (NT), sodium bicarbonate powder (SB), and glycine powder (GL). Each group was subdivided into 2 groups based on what adhesive systems were used: conventional system (A) and universal system (B). Composite resin was applied on the buccal surface of the teeth in a block measurement 8x8x6 mm. The specimens were cut to obtain beams measuring 1.0 x 1.0 mm and were subjected to microtensile bond strength tests. Results were compared using two-way ANOVA ($p \leq 0.05$).

Results: The GLA group obtained the highest bond strength value for the conventional adhesive (18.97 MPa), but the GLB group obtained a lower strength value than the SBB group (GLB: 21.05 MPa and SBB: 22.29 MPa) ($p < 0.05$).

Conclusions: Cleaning of the enamel surface increases the adhesive properties of restorative materials, and the bond strength was more effective in the group that received glycine prophylaxis and the conventional adhesive system.

Uniterms: Dental enamel. Dental Bonding. Dental prophylaxis. Glycine. Tensile Strength.

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INTRODUCTION

Different methods of dental surface treatment have been used to increase the longevity of adhesive restorations. It is important to execute prophylaxis in order to remove plaque, contaminants, and other components that may interfere with the etching process and with the interaction between the restorative material and the dental surface[1,2]. The use of rubber cups with polishing pastes, such as pumice paste, abrasive brushes, dental floss, and curettes are among the most widely used cleaning methods[3,4]. Greater success in removing supra and subgingival plaque was obtained with the advent of the air polishing prophylactic system. This system has many positive aspects, including the removal of bacterial plaque, an increase in sealant retention, and the bonding of adhesive restorative materials, but it also has negative aspects related to its use on the dental structure. Several authors described that the use of a sodium bicarbonate jet may cause dentin erosion, residue accumulation on the dental surface, cavity margin degradation[3], and tooth abrasion and wear, especially on the enamel, thus reducing its microhardness[5]; it can also increase the surface roughness of restorations and dental tissues[6-11].

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Due to these factors, adhesive procedures are not recommended after dental prophylaxis because they can interfere with the microtensile bond strength of composites, such as resinous materials onto the dental structure. The interferences with composite resin adhesion[1], the presence of powder residues on the dental surface[12,13], among other observations were found in the literature as being some of the causes for this decrease in bond strength. By contrast, studies show that dental prophylaxis, such as sodium bicarbonate air polishing, did not affect dental substrate adhesion[14,15]. The bond strength was increased [16,17], which supports the importance of previous dental prophylaxis, since the enamel surface needs to be clean and residue-free in order to have a good material-enamel interaction and bonding so as to improve longevity and the mechanical resistance of restorations.

The use of glycine is a safe and effective alternative to dental prophylaxis[18]. Other authors have evaluated its effects on the wear of the dental structure when compared to sodium bicarbonate, as well as its effects on the gingiva, implants, and peri-implant tissues[2,7,19,-22]. This product was developed to improve professional dental prophylaxis by removing biofilm, dental plaque, and stains. It can also be used on brackets, restorative and prosthetic materials, and implants, as well as in periodontal therapy in the presence of shallow periodontal pockets[7] (Technical profile of the Clinpro Prophy Powder, 3M ESPE, Seefeld, Germany). Although this is a product available for clinical practice, no evidence has been discovered regarding its effect on enamel bond strength.

Therefore, this study aimed to compare the effects of dental sodium bicarbonate jet prophylaxis and amino acid glycine powder on the microtensile bond strength of bovine dental enamel. Considering that studies about amino acid glycine powder are scarce in the literature, the present study aimed to shed light on this unresolved issue.

MATERIAL AND METHODS

This study was approved by the Ethical Use of Animals Committee (CEUA, in Portuguese), logged under protocol number 212/2016. The manufacturer's instructions for each product used in this study were followed, and only one experienced operator performed the tests. The materials used in this study are listed in Table 1.

Table 1. Materials used in the study.

Product	Composition	Methodology	Manufacturer
Composite resin: Filtek Z350 XT A2E	Bis-GMA, UDMA, TEGDMA, Bis-EMA resins, Silica (20 nm nano-agglomerated/ aggregated), zirconia (4-11 nm -a/aggregated and agglomerated), clusters, zirconia/silica aggregated particles (20 nm silica particles combined with 4-11 zirconia 3).	1.5 mm increments applied on the vestibular surface of the teeth, forming an 8x8x6 mm block. Each increment was light cured with LED light for 20 s.	3M ESPE, St Paul, USA
Sodium bicarbonate powder: Prophylaxis	Pure sodium bicarbonate (99.7%), Silicic Anhydride, Essence.	Prophylactic jet applied 5 mm from the surface of the teeth, for 10 s, perpendicularly.	Formaden, Paraná, Brazil
Glycine powder: Clinpro Prophy Powder™	Glycine (99%).	Prophylactic jet applied 5 mm from the surface of the teeth, for 10 s, perpendicularly.	3M ESPE, St Paul, USA
Conventional adhesive: Adper Single Bond™ 2	Dimethacrylate resins, HEMA, Vitrebond™ Copolymer, Filler, Ethanol, Water, Initiators.	Active application of one layer for 15 s, interval of 30 s, and application of the second layer of adhesive. After 30 additional seconds, application of air jet for 10 s at a distance of 10 cm (for evaporation of the solvents), excess removal of the adhesive, and light cure for 20 s.	3M ESPE, St Paul, USA
Universal adhesive: Single Bond Universal	MDP Phosphate Monomer, Dimethacrylate resins, HEMA, Vitrebond™ Copolymer, Filler, Ethanol, Water, Initiators, Silane.	Active application of one layer of the adhesive for 20 s. After an interval of 30 seconds, application of air jet for 10 s at a distance of 10 cm (for evaporation of the solvents), excess removal of the adhesive, and light cure for 20 s.	3M ESPE, St Paul, USA
Phosphoric acid at 37%: Condac	Phosphoric Acid at 37%, thickener, pigment, and deionized water.	Etching of the enamel surface for 30 seconds and rinse with water/air spray for 30 seconds.	FGM, Santa Catarina, Brazil
Light curing unit/ photopolymerizer: LED Radii Cal	Irradiance: 940 mW/cm2	Light curing of the composite resin and adhesive for 20 s.	SDI, Bayswater, Australia
Prophylactic equipment: Profi Neo	-	Sodium bicarbonate or glycine powder prophylactic jet for 10 s, from a distance of 5 mm of the enamel surface, perpendicular.	Dabi Atlante, Ribeirão Preto, Brazil

Bis-GMA: Bisphenol A-glycidyl methacrylate; UDMA: Urethane dimethacrylate; TEGDMA: Triethylene glycol dimethacrylate; Bis-EMA: Bisphenol A ethoxylate dimethacrylates; HEMA: Hydroxyethyl Methacrylate.

SPECIMEN PREPARATION

Thirty-six bovine incisors were extracted from the mandibles. The selection of the teeth considered the presence of fractures and cavity lesions on the surface, factors that resulted in the discarding of the material and substitution with healthy teeth.

The tissue remaining on the roots of the teeth was removed with periodontal curettes to help with posterior handling for the surface preparation and treatment phases. The buccal surface of the crowns of the teeth was polished with a Robinson brush and pumice powder paste to remove any leftover residues that may interfere in the procedures. Next, the same surface of the teeth was polished, using a Politriz device (Arotec S/A Ind. Comércio – Cotia, São Paulo – Brasil) with sandpaper with a granulation of 400 and 600 under constant refrigeration until the surface of the enamel was flat and homogeneous, and the roots were sectioned from the crowns using a diamond disk in order to allow for the generation of the specimen. These teeth were stored in a closed glass with sterile saline solution at 6º - 10ºC until the experiments had been performed.

The teeth were then divided randomly into six groups (n = 6) based on the type of prophylactic treatment and the type of adhesive system applied, as shown in Table 2. Air polishing with the glycine (Clinpro Prophy Powder™ - 3M ESPE, St Paul, USA) and sodium bicarbonate jet (Formaden, Paraná, Brazil) was performed using an air polishing unit Profi Neo (Dabi Atlante – Ribeirão Preto – Brazil) at a distance of 5 mm from the dental surface for 10 seconds at a 90º angle. The teeth were rinsed with a water/air spray at a standardized time of 30 seconds, and absorbent paper (coffee filter) was used to dry the surface. All the teeth were acid conditioned with a phosphoric acid of 37% Condac (FGM – Santa Catarina – Brazil) for 30 seconds and rinsed with water/air spray for the same amount of time.

Following the manufacturer's instructions, the conventional adhesive was applied actively in two layers, using a microbrush with a 30-second interval between the layers to volatize the solvents. Thirty seconds after the application of the two layers, a brief jet of air was applied from a distance of 10 cm to volatize the solvents. Strips of absorbent paper were used to remove any excess adhesive, and light-curing (LED Radii Cal, SDI, Bayswater, Australia) was performed for 20 seconds.

For the universal adhesive, only one layer was applied actively for 20 seconds, with a 30 second interval, to allow for the volatilization of the solvents. The excess adhesive was removed with strips of absorbent paper. The times for drying and light-curing were the same as those for the conventional system.

Next, an area of 8 mm x 8 mm was defined on the vestibular surface of each tooth, where 1.5 mm thick increments of composite resin were applied, forming a block measuring 8x8x6 mm. Each composite resin increment (Filtek Z350 XT - 3M ESPE, St Paul, USA) was photopolymerized with a light curing unit LED Radii Cal (SDI – Bayswater – Australia), with an irradiance of 940 mW/cm2 for 20 seconds. The resin A2E color was chosen to allow adequate light to pass through the increments during light-curing.

The teeth with the composite resin block were stored in sterile saline solution in a glass container at 6º - 10ºC for 24 hours. These were then fixed with Godiva impression sticks on a base to facilitate posterior cutting to obtain the specimen beams. First, a universal cutting machine (Isomet 1000 Precision Saw, Buehler, USA) was used to cut the specimens in the buccal-lingual direction under constant refrigeration and at 20,000 RPM, obtaining 1.0 mm-thick and 9.0 mm-long sheets, which were cut again to obtain beams exposing the tooth-restoration interface.

Table 2. Prophylactic treatments and adhesive systems.

Groups	Treatments	Acid conditioning	Adhesive systems	Composite resin
NT A	No prophylactic treatment; Air/water spray	Phosphoric acid 37%- 30 s	Adper Single Bond 2	Filtek Z350 XT A2E
SB A	Sodium bicarbonate jet – 10 s	Phosphoric acid 37%- 30 s	Adper Single Bond 2	Filtek Z350 XT A2E
GL A	Clinpro™ Prophy™ Powder - 10 s	Phosphoric acid 37%- 30 s	Adper Single Bond 2	Filtek Z350 XT A2E
NT B	No prophylactic treatment; Air/water spray	Phosphoric acid 37%- 30 s	Single Bond Universal	Filtek Z350 XT A2E
SB B	Sodium bicarbonate jet – 10 s	Phosphoric acid 37%- 30 s	Single Bond Universal	Filtek Z350 XT A2E
GL B	Clinpro™ Prophy™ Powder - 10S	Phosphoric acid 37%- 30 s	Single Bond Universal	Filtek Z350 XT A2E

MICROTENSILE BOND STRENGTH TEST

The adhesive resistance tests were conducted using a mechanical testing machine (Bisco Shear Bond Tester, Schaumburg, IL, USA). Each specimen was fixed onto the extremities of the microtraction device and were then loaded until fracture of the dentin-resin interface occurred. The loading rate speed was 1 mm/minute. The fracture load was displayed in Newtons by the equipment, and the fractured fragments were collected, using an optical microscope with a magnification of 8x to 32x (Stereoscope microscope Stemi DV4, Zeiss, Germany), to verify the type of fracture: adhesive, cohesive, or mixed.

STATISTICAL ANALYSIS

The microtensile values were displayed on the machine, and after measuring the fracture area in millimeters with a digital pachymeter, the tension in MegaPascal (MPa) was calculated for each specimen. The Shapiro-Wilk test was used to check normality. A quantitative analysis was performed, and the results were subjected to a two-way ANOVA analysis with a 95% confidence level (CI) to compare the groups.

RESULTS

The average microtensile and standard deviation values of the microtraction assays are shown in Table 3. The specimen group that received prophylactic treatment with the glycine powder and etch-and-rinse adhesive presented the highest microtensile value when compared to the other two groups with the same adhesive system (GL A: 18.97 MPa). The SBA and NTA groups presented microtensile values with differences that were not statistically significant (SB A: 16.07 MPa and NT A: 15.37 MPa) (Figure 1). By contrast, the corresponding group with the universal adhesive system (GL B: 21.05 MPa) obtained lower tension values than the group that received the sodium bicarbonate powder jet (SB B: 22.29 MPa) (Fig 2).

Table 3. Tension values and standard deviations of each group according to the type of prophylactic treatment received.

Group	Tension (MPa)
NT A	15.37 ± 1.79
SB A*	16.07 ± 0.53
GL A	18.97 ± 0.65
NT B	19.07 ± 1.85
SB B *	22.29 ± 1.10
GL B	21.05 ± 0.78

*Among the groups of different adhesive systems, statistically significant difference was recorded between the groups SB A – SB B (*).

Figure 1. Graphic representation of the microtensile bond strength of all the groups in which the 3M ESPE Adper Single BondTM 2 adhesive was applied, according to the type of prophylactic treatment received. Group NT A- No prophylactic treatment; Group SB A- Sodium bicarbonate jet prophylaxis; Group GL A- 3M ESPE ClinproTM ProphyTM PowderTM glycine jet prophylaxis.

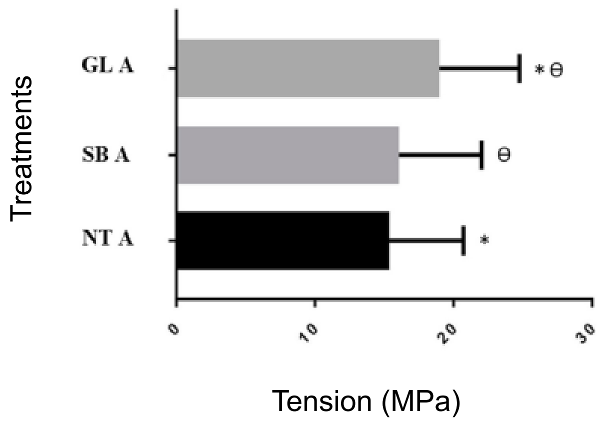
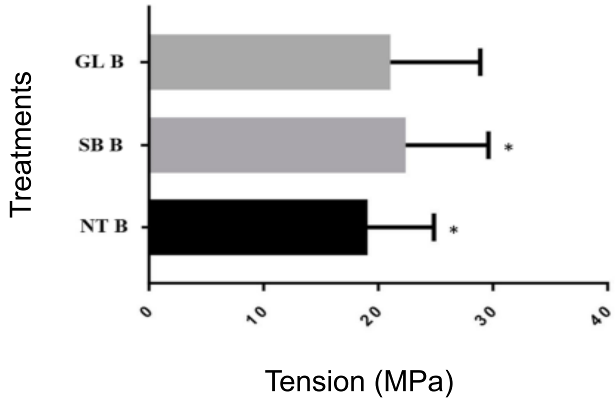


Figure 2. Graphic representation of the microtensile bond strength of all the groups in which the 3M Universal Single Bond adhesive was applied, according to the type of prophylactic treatment received. Group NT B- No prophylactic treatment; Group SB B- Sodium bicarbonate jet prophylaxis; Group GL B- 3M ESPE ClinproTM ProphyTM PowderTM glycine jet prophylaxis.



For the universal adhesive system groups, that which received the sodium bicarbonate powder jet presented the highest mean values of all six groups (SB B: 22.29 MPa), which were not statistically greater than the control group of the same adhesive system (NT B: 19.07 MPa). Statistically significant differences were recorded between the groups using a two-way ANOVA: NT A – SB B ($p < 0.01$); NT A – GL B ($p < 0.05$); SB A – SB B ($p < 0.01$); and SBA – GL B ($p < 0.05$).

DISCUSSION

Prophylaxis is directly related to the adhesion process on the dental structure. These cleaning procedures are executed to improve the dental surface characteristics prior to the etching process with conditioning phosphoric acid, especially for the removal of dental plaque and contaminants, among other residues[23]. The dental biofilm on the enamel surface is known to interfere with the adhesion of resinous restorative materials. Salivary contamination before acid conditioning can affect the bonding between composite resin and enamel. In the present study, the enamel surface of all specimens was standardized for the removal of plaque and contaminants with pumice polishing. The bond resistance of two adhesive systems was evaluated on the enamel in normal conditions and after contamination by water, saliva, plasma, high speed oil lubricant, zinc oxide-eugenol cement, and zinc oxide with no eugenol, and it was observed that most of these contaminants reduced bonding resistance[24]. The results obtained in this study support the importance of cleaning and prophylaxis prior to adhesive procedures. It was observed that the groups that did not receive prophylactic treatment with SB or GL had decreased, and equivalent tensile values were found when compared to those that received the prophylaxis.

The air polishing dental prophylactic system is stated in the literature as being one of the most efficient and useful cleaning methods of the enamel surface[9,10,23,25]. The sodium bicarbonate powder particles, when released under pressure on the enamel surface, gain more superficial energy, which increases the probability of removing the aprismatic enamel that may be covering its prismatic structure. As the latter is related to a roughness surface, it promotes a higher retention of composites[16,17,26,27].

Many factors have been studied as causes for the decrease in bonding resistance of resins on teeth due to this prophylactic method, which contraindicates the use of adhesive procedures immediately after prophylaxis. The production of interferences on the resin adhesion can be observed even when conditioning acids with low pH were used[1]. In this study, the groups of specimens that received no type of prophylactic treatment showed decreased adhesive resistance values, regardless of the adhesive system used. Another study showed that the use of a sodium bicarbonate jet negatively influenced the microtension bond strength of indirect resins on dentin using resinous cement[13]. These results are likely explained due to powder residues that remain on the dental surfaces when the bicarbonate jet[13,25] is used, which serves as a chemical and/ or mechanical obstacle for the conditioning acid or acid primer[1,26].

Although the present study evaluated the prophylactic effect of air polishing powders on the enamel surface, the authors are still concerned with the investigation of the adhesion process and interfering factors. Even after sufficient surface cleaning with water and air spray, the buffer effect of the sodium bicarbonate powder can remain over the dental structure, affecting the primer's acidity. Similar results were found by a previous study[28], which showed that sodium bicarbonate jet prophylaxis interferes with adhesion to the dental substrate. Therefore, the need for new products that present less interference with the bonding process to dental substrates, either dentin or enamel, is clear[25-29].

The present study demonstrated an increase in adhesion observed in the group that received prophylaxis with glycine powder and the etch-and-rinse adhesive system. The main advantage of glycine is related to its low abrasiveness to the dental structure when compared with sodium bicarbonate[9,16,18]. Its particles are approximately 4-fold smaller, with dimensions of 20 – 60 μm, and have a high solubility in water[2], which makes this powder more advantageous than sodium bicarbonate for dental prophylaxis. The use of glycine allows for efficient plaque and stain removal on the surface of the tooth and is less aggressive on the gingiva[19]. The influence of prophylaxis using glycine powder was evaluated on the adhesion of a CAD/CAM nano-ceramic resinous material to the dentin using adhesive cements[30]. The authors used different methods of acid conditioning and concluded that glycine may have increased the bonding resistance of self-adhesive resinous cements.

Universal adhesives have become a trend in dentistry. The presence of 10-MDP (10-methacryloyloxydecyl dihydrogen phosphate) and other phosphoric acid ester for novel adhesive formulations are responsible for the self-etching of these materials[31,32]. Nevertheless, flexibility of universal adhesives has enjoyed increasing popularity in the clinical setting, hence the need to further investigate better ways to use universal and conventional adhesives. Research to clarify the relationship between prophylaxis, bond resistance, and clinical results would make a valuable contribution to the field. The glycine powder did not affect the adhesion efficacy of adhesives to dentin[31]. Among the universal system adhesive groups, that which received glycine prophylactic treatment presented decreased tension values when compared to the group that received sodium bicarbonate prophylaxis. Considering the particle size of the sodium bicarbonate powder when compared to the size of the glycine particles, the former causes more abrasiveness and wear on the surface of the enamel. This may explain the increased tension values obtained in these groups, as a greater number of retentions are created for the penetration of resinous monomers, which favors micromechanical adhesion[8]. In addition, it allows for a better interaction with the 10-MDP, a component present in the universal system adhesives with a high chemical interaction capacity with the enamel's hydroxyapatite crystals[33,34].

CONCLUSION

The results of this study, considering the materials and methods used, allowed for the following conclusions:

This study demonstrated that dental prophylaxis should be considered when considering the adhesion of resinous materials to the enamel surface.

A higher bonding resistance value was observed after prophylactic treatment when using amino acid glycine powder or sodium bicarbonate together with the universal adhesive system.

1. The group that received glycine powder prophylactic treatment, when applied to the universal adhesive system, showed decreased tension values when compared to the group that received sodium bicarbonate prophylaxis.
2. More studies are needed that include hardness to check the abrasion that occurs in the sample after cleaning with sodium bicarbonate and glycine powder.

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REFERENCES

1. Armas-Vega ADC. Efeitos do tratamento de limpeza na resistência de união adesiva autocondicionante ao esmalte dentário não polido após contato salivar [tese de

doutorado]. São Paulo: Faculdade de Odontologia da USP; 2005.
2. Petersilka GJ, Tunkel J, Barakos K, Heinecke A, Haberlein I, Flemming TF. Subgingival plaque removal at interdental sites using a low-abrasive air polishing powder. J Periodontol. 2003;74(3):307-11.
3. Barnes CM. Air polishing: a mainstay for dental hygiene. Tulsa: RDH; 2013 [access in 2017 Jun 20]. Available from: https://dentalacademyofce.com/courses/2423/PDF/1305cei_Barnes_RDH_final.pdf
4. Marta SN, Lima JEO, Vono BG, Silva SMB. Avaliação quantitativa do efeito do jato de bicarbonato de sódio no esmalte de dentes permanentes jovens. Rev Odontol Univ São Paulo. 1999;13(1):19-24.
5. Ribeiro HZV. Avaliação do efeito da profilaxia profissional com jato de bicarbonato de sódio e do efeito remineralizador da saliva artificial. Estudo "in vitro" [dissertação]. Bauru: Curso de Odontologia, Universidade de São Paulo; 2005.
6. Acevedo RAA, Andrade LEH, Espinoza M, Silva EB, Sampaio JEC. Avaliação do efeito de diferentes pós de bicarbonato sobre a superfície radicular. Periodontia. 2010;20(4):61-7.
7. Bühler J, Schmidli F, Weiger R, Walter C. Analysis of the effects of air polishing powders containing sodium bicarbonate and glycine on human teeth. Clin Oral Investig. 2015;19:877-885.
8. Fratolin MM, Bianco VC, Santos MJ, Rizkalla AS, Santos GC Jr. The Effect of Prophylactic Powders on the Surface Roughness of Enamel. Compend Contin Educ Dent. 2014;35(9):e31-5.
9. Vieira RG, Silva GFJ, Rocha LEMD, Terezan MLF. Polimento dental a ar: utilização de bicarbonato de sódio ou glicina. Braz J Periodontol. 2015;25(4):44-9.
10. Willman DE, Norling BK, Johnson WN. A new prophylaxis instrument: effect on enamel alterations. J Am Dent Assoc. 1980;101(6):923-5.
11. Salami D, Luz MAAC. Effect of prophylactic treatments on the supericial roughness of dental tissues and of two esthetic restorative materials. Pesqui Odontol Bras. 2003;17(1):63-8.
12. Bester SP, de Wet FA, Nel JC, Driessen CH. The effect of airbone particle abrasion on the dentin smear layer and dentin: an in vitro investigation. Int J Prosthodont 1995; 8:46-50.
13. Soares CJ, Pereira JC, Souza SJB, Menezes MS, Armstrong SR. The effect of prophylaxis method on microtensile bond strength of indirect restorations to dentin. Oper Dent. 2012;37(6):602-9.
14. Flury S, Peutzfeldt A, Schmidlin PR, Lussi A. Exposed dentin: influence of cleaning procedures and simulated pulpal pressure on bond strength of a universal adhesive system. PLoS One. 2017;12(1):1-10.
15. Rosin C, Arana-Chaves VE, Netto NG, Luz MAAC. Effects of cleaning agents on bond strength to dentin. Braz Oral Res. 2005;19(2):127-33.
16. Brockmann SL, Scott RL, Eick JD. The effect of an air-polishing device on tensile bond strength of a dental sealant. Quintessence Int. 1989;20(3):211-7.
17. Teixeira SRC. Influência de dois métodos de profilaxia na resistência ao cisalhamento da colagem de um selante em superfície de esmalte bovino tratado ou não com solução de tetrafluoreto de titânio a 4% [dissertaçâo]. Rio de Janeiro: Faculdade de Odontologia, Universidade Federal do Rio de Janeiro; 2003.
18. Petersilka GJ, Bell M, Häberlein I, Mehl A, Hickel R, Flemmig TF. In vitro evaluation of novel low abrasive airpolishing powders. J Clin Periodontol. 2003;30(1):9-13.
19. Petersilka GJ, Faggion JR, Stratmann U, Gerss J, Ehmke B, Haeberlein I, et al. Effect of glycine powder air-polishing on the gingiva. J Clin Periodontol. 2008;35(4):324-32.
20. Sahrmann P, Ronay V, Sener B, Jung RE, Attin T, Schmidlin PR. Cleaning potential of glycine air-flow application in an in vitro peri-implantitis model. Clin Oral Implants Res. 2012;24(6):666-70.
21. Janiszewska-Olszowska J, Drozdzik A, Tandecka K, Grocholewicz K. Effect of air-polishing on surface roughness of composite dental restorative material - comparison of three different air-polishing powders. BMC Oral Health. 2020;20(1):30. doi: 10.1186/s12903-020-1007-y. PMID: 32000753; PMCID: PMC6993449.
22. Cobb CM, Daubert DM, Davis K, Deming J, Flemmig TF, Pattison A, et al. Consensus conference findings on supragingival and subgingival air polishing. Compend Contin Educ Dent. 2017;38(2):e1-e4. PMID: 28156118.
23. Hosoya Y, Johnston JW. Evaluation of various cleaning and polishing methods on primary enamel. J Pedod. 1989;13(3):253-69.
24. Xie J, Powers JM, Mc Guckin RS. In vitro bond strength of two adhesives to enamel and dentin under normal and contaminated conditions. Dent Mater. 1993;9(5):295-9.

25. Brocklehurst PR, Joshi RI, Northeast SE. The effect of air polishing occlusal surfaces on the penetration of fissures by a sealant. Int J Paediatr Dent. 1992;2(3):157-62.
26. Christensen GJ. Fluoride made it: why haven't sealants? J Am Dent Assoc. 1992;123(2):89-90.
27. Sol E, Espasa E, Boj JR, Canalda C. Effect of different prophylaxis methods on sealant adhesion. J Clin Pediatr Dent. 2000;24(3):211-4.
28. Nishimura K, Nikaido T, Foxton RM, Tagami J. Effect of air-powder polishing on dentin adhesion of a self etching primer bonding system. Dent Mater J. 2005;24(1):59-65.
29. Nikaido T, Yamada T, Koh Y, Burrow MF, Takatsu T. Effect of air-powder polishing on adhesion of bonding systems to tooth substrates. Dent Mater. 1995;11(4):258-64.
30. Ceci M, Pigozzo M, Scribante A, Beltrami R, Colombo M, Chiesa M, et al. Effect of glycine pretreatment on the shear bond strength of a CAD/CAM resin nano ceramic material to dentin. J Clin Exp Dent. 2016;8(2):146-52.
31. Yamauchi K, Tsujimoto A, Jurado CA, Shimatani Y, Nagura Y, Takamizawa T, et al. Etch-and-rinse vs self-etch mode for dentin bonding effectiveness of universal adhesives. J Oral Sci. 2019;61(4):549-53. doi: 10.2334/josnusd.18-0433. Epub 2019 Oct 21. PMID: 31631096.
32. Cardoso GC, Nakanishi L, Isolan CP, Jardim PDS, Moraes RR. Bond stability of universal adhesives applied to dentin using etch-and-rinse or self-etch strategies. Braz Dent J. 2019;30(5):467-75. doi: 10.1590/0103-6440201902578. PMID: 31596331.
33. Frankenberger R, Lohbauer U, Tay FR, Taschner M, Nikolaenko SA. The effect of different air-polishing powders on dentin bonding. J Adhes Dent. 2007;9(4):381-9.
34. Figueiredo MMCFA. Adesão química: a incorporação do monómero 10-MDP nos adesivos dentários [dissertação]. Porto: Faculdade de Medicina Dentária da Universidade do Porto; 2015.

A influência da profilaxia com aminoácido glicina em pó e jato de bicarbonato de sódio na resistência de união do esmalte dentário

Objetivo: Comparar a influência da profilaxia com bicarbonato de sódio e ClinproProphy ™ na resistência de união do esmalte de dentes bovinos e nas propriedades de dois sistemas adesivos.

Métodos: Trinta e seis incisivos bovinos extraídos foram divididos aleatoriamente em 6 grupos (n = 6), cada um de acordo com o tratamento profilático recebido: nenhum tratamento profilático (NT), bicarbonato de sódio em pó (SB), glicina em pó (GL). Cada grupo foi subdividido em 2 grupos com base nos sistemas adesivos utilizados: sistema convencional (A) e sistema universal (B). A resina composta foi aplicada na superfície bucal dos dentes em um bloco de 8x8x6 mm. As amostras foram cortadas para obter blocos medindo 1,0 x 1,0 mm e submetidas a testes de resistência de união por microtração. Os resultados foram comparados usando o teste two-way ANOVA ($p \leq 0,05$).

Resultados: O grupo GLA obteve o maior valor de resistência de união para o adesivo convencional (18,97 MPa), mas o grupo GLB obteve um valor de resistência menor que o grupo SBB (GLB: 21,05 MPa e SBB: 22,29 MPa) ($p < 0,05$).

Conclusão: A limpeza da superfície do esmalte aumenta as propriedades adesivas dos materiais restauradores, e a resistência adesiva foi mais eficaz no grupo que recebeu profilaxia com glicina e sistema adesivo convencional.