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Influence of different antioxidant agents on the microtensile bond strength of restored teeth after bleaching

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and consequent increase in the treatment efficacy [2,3]. This pilot study was aimed to evaluate the effect of PAE, with 37.5% orthophosphoric acid, on *Commission Internationale de l'Éclairage* (CIE) L*a*b* parameters after IB with 16% carbamide peroxide (CP), as a function of application time.
Materials and Methods: This study was approved by the Ethics Committee of Egas Moniz, CRL. Twenty sound molars were selected and randomly assigned to four experimental groups ($n = 5$, each): G1 – control group (without PAE or CP); G2 – 16% CP (without PAE); G3 – PAE for 15 s + 16% CP; G4 – PAE for 30 s + 16% CP. The initial colour was measured using a spectrophotometer and the correspondent CIE L*a*b* parameter values were obtained. Three sessions were performed every seven days. For the CG, a glycerine and carbopol placebo gel was applied. In the second and third sessions, for all groups the same procedures were performed except PAE step which was only applied in the first session of the respective groups. After 21 days, calcium hydroxide was placed on all teeth in order to neutralise the environment and standardise the experimental groups prior to restoration. The final colour was measured after 15 days, a restoration was performed with composite resin and the teeth were submitted to microtensile bond strength (μTBS) evaluation. For each fractured stick, the failure mode was classified according to its location [4]. Data was submitted to descriptive and comparative inferential statistical analysis. In the latter, a significance level of 5% was used.
Results: A statistically significant increase in the mean L* parameter (luminosity) was observed after bleaching, with acid-etched groups showing the highest values. Mean a* and b* parameters (chroma) showed a statistically significant reduction in the groups submitted to PAE (G3, G4). Overall, these groups presented the lowest bond strength values. However, only G4 exhibited a statistically significant difference compared to G1 (p=.021) and to G2 (p=.010) while there was no statistically significant difference when considering G3 (p=.426).
Discussion and conclusions: In light of the obtained results, the best clinic option will be to perform an orthophosphoric acid application for 15 s, prior to internal bleaching procedures, since tooth luminosity values increase and chroma values decrease, without affecting the microtensile bond strength. Thus, in this way, an improvement on internal bleaching outcome is achieved, without compromising the final restoration bond strength.

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Influence of different antioxidant agents on the microtensile bond strength of restored teeth after bleaching

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ABSTRACT
Introduction: Due to an increase in patient awareness and search for aesthetic treatments, dental bleaching is a frequent and safe procedure in clinical practice for the removal of stains [1]. Bleaching agents are known to adversely affect the bond strength between resin composite and tooth surface, when adhesive procedures are performed immediately after tooth bleaching [2]. The reduction in bond strength is related to the presence of residual oxygen, a sub product of hydrogen peroxide that remains on the tooth surface and which may interfere with infiltration of the resin in the dentine tubules and inhibit the polymerisation of resin monomers [3]. Antioxidant agents like sodium ascorbate, grape seed

extract and green tea may be used as an alternative to delay the restorative procedure due to their potential as reversers of these adverse effects [2]. This study aims to assess the influence of different antioxidant agents on the bond strength of restored bleached teeth.
Materials and methods: The present study was approved by the Ethics Committee of Instituto Universitário Egas Moniz. Fifteen human permanent molars were sectioned into identical halves that were randomly distributed between five groups ($n = 6$): unbleached control group (CG), bleaching + resin composite bonded immediately (G1), bleaching + sodium ascorbate (G2), bleaching + grape seed extract (G3) and bleaching + green tea (G4). G1, G2, G3 and G4 were bleached for 4 h/day for a 7-day period. After bleaching, G1 samples were immediately restored with an adhesive system and a resin composite, in G2 samples a 10% sodium ascorbate gel was applied, in G3 a 5% grape seed extract and in G4 a 5% green tea, all applied for 15 min. After these antioxidants, G2, G3 and G4 were immediately restored. After 24 h, samples were sectioned in order to obtain 1.0 (± 0.3) mm^2 microspecimens. The microspecimens were tested in a universal testing machine at a speed of 0.5 mm/min. Data were analysed by using a two-way ANOVA, at a significance level of 5%.
Results: G1 group (bleaching only) recorded the lowest mean bond strength value (9.5 (± 1.2) MPa) and it was significantly lower than the control group (CG) (19.3 (± 2.7) MPa) ($p = .001$). Groups in which sodium ascorbate (G2) (19.2 (± 1.3) MPa), grape seed extract (G3) (16.5 (± 0.8) MPa) and green tea (G4) (16.7 (± 2.0) MPa) were applied presented significantly higher bond strength values when compared to bleaching only (G1) ($p < .001$). When comparing the antioxidant agents, G2 (10% sodium ascorbate) exhibited significantly higher mean bond strength values when compared to G3 (5% grape seed extract) ($p = .016$).
Discussion and conclusions: Treatment of the enamel surface with antioxidant agents such as sodium ascorbate, grape seed extract and green tea following the bleaching procedure and immediately before the restorative procedure can reverse the compromised bond strength. These alternative strategies are effective and may be used instead of delaying the procedure.

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Influence of silane type and application time on the bond strength to leucite reinforced ceramics

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ABSTRACT
Introduction: All-ceramic restorations currently dominate the market of indirect restorative materials due to their biocompatibility, longevity and superior aesthetics [1]. Silica-based ceramics, such as leucite, carry the advantage of being receptive to surface treatments, making them bondable to tooth substrates [2]. However, a standardised application protocol regarding silane coupling agents is lacking. Such step is critical to ensure durability of the restoration placed *in situ*. Post-etch cleaning and silane application have been proven to increase bond strength, however, this step varies for each material [3]. The aim of this research was to assess the influence of different types of silane coupling agents and respective application times on the bond strength of the ceramic-resin interface.
Materials and methods: Ten leucite reinforced glass ceramic blocks (IPS Empress CAD LT BL4/C 14) were divided into equal halves. Of the samples obtained, 6 were randomly divided into three groups according to the silane used: **G1** BIS-Silane (Bisco, Schaumburg, IL, USA); **G2** ESPE Sil Silane Coupling Agent (3 M ESPE AG, Seefeld, Germany); **G3** Monobond Plus (Ivoclar-Vivadent, Schaan, Liechtenstein). Each was then divided into two subgroups, according to the surface conditioning time: **T1** (1 min.) or **T2** (5 min.). Each block was acid etched (HF 9.5% − 1 min), post-etching cleaned (OPA 37.5% − 1 min; ultrasonication − 2 min.) and silanized. Heat treatment was carried out at 100 °C (1 min.). Then a thin layer of Optibond FL (Kerr) adhesive was applied and each block was adhered to pre-heated resin at 55 °C. The samples were light cured for 40 s on each side (1200 mW/cm^2). Samples were sectioned into microspecimens (1 ± 0.2 mm^2) that were subjected to aging (10,000 thermocycles − 5 and 55 °C). The microspecimens were tested in tension at a crosshead speed of 0.5 mm/min, until they debonded. Data analysis was carried out by a two-way ANOVA, at a significance level of 5%.