Influence of aluminium oxide particles on bond strength after dentin sealing

Introducing... Immediate dentin sealing technique (IDS) was introduced as an alternative to conventional procedure after teeth preparation for indirect restorations.1 In this technique, a dentin bonding agent is immediately applied on the freshly cut dentin before taking impression and before the provisionalization. It promotes decontamination of the dentin, the decrease of both post-operative sensitivity and micro-leakage and the improvement of the bond strength values.1 1 1 AOS was referred to as the gold standard surface treatment, improving the wettability for the adhesive process and therefore dental adhesion.1 1 1 However, it is not clear how to optimize bond strength to indirect restorations.1 1 1

Objective
To test the microtensile bond strength (μTBS) of immediate dentin sealing, after applying different types and sizes of aluminum oxide particles with different exposure times.

Materials and Methods
Eighteen healthy molars received IDS technique with Optibond® FL (Kerr, Orange, USA) after dentin exposure and were stored in distilled water at 37°C for 24 hours (Fig. 1 and 2).

Results
In groups sandblasted with AOP for 4 seconds, the bond strength values vary significantly between 30μm-silica-coated group and Slurry group (53.31±23.89 MPa versus 43.27±6.06 MPa and 41.92±23.77 MPa respectively, p<0.001) (see Chart 1). In groups sandblasted with AOP for 10 seconds, the significant differences were found between 30μm-silica-coated group and 27μm and 30μm groups (43.27±6.06 MPa versus 47.26±17.44 MPa and 41.92±23.77 MPa respectively, p<0.001) (see Chart 1). Bond strength values were higher in groups sandblasted for 10 seconds than the ones sandblasted for 4 seconds. Regardless of particles size or type (27μm, 30μm, silica-coated 30μm, silica-coated 43.27±6.06 MPa versus 47.26±17.44 MPa and 43.27±6.06 MPa versus 41.92±23.77 MPa and 41.92±23.77 MPa versus 39.50±21.40 MPa respectively), even though differences were not statistically significant (p>0.05) (see Chart 1).

Discussion
Sandblasting dentin's surface with silica-coated AOP showed better results on bond strength possibly justified by the chemical composition of the particles.2 2 Sandblasting with this type of particles increases the surface temperature momentarily to about 1200ºC, so particles are embedded into the surface of substrates and leave it partially coated with silica.8 Currently, there are no studies reporting a standard time and substrate temperature for sandblasting dentin's surface.6 Sandblasting with this type of particles increases the surface temperature momentarily to about 1200ºC, so particles are embedded into the surface of substrates and leave it partially coated with silica.8 Currently, there are no studies reporting a standard time and substrate temperature for sandblasting dentin's surface.6

Conclusion
Microtensile bond strength (μTBS) of immediate dentin sealing was influenced by different types of AOP. Different exposure times to AOP did not influence the bond strength values. In addition to the results of the research, further studies are needed about adhesive protocols applied to indirect restorations.

Clinical Implications
Sandblasting dentin's surface with silica-coated AOP after IDS technique achieves better bond strength values than other diameters or types of AOP.