

Advancements in adhesive dentistry: a case report

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With many universal adhesives being offered by the dental industry nowadays, it is not always easy to decide if it could be worth it to make a switch of product in your practice. For every single case you work on, you have to make a number of choices over and over again. To make wise and deliberate decisions each time, we need to have a thorough understanding of what we are doing. This also includes knowledge about the products that we are using: how they function and why we are using them. Applying a technique without thinking and without knowing why can't guide you to excellence.

Through a clinical case, we will try to clarify the reasons that have guided us towards the switch to G2-BOND Universal.

Clinical case report

A 50-year-old patient who had many dental treatments in the past, was seeking retreatment. She also complained of occlusion-related problems in the posterior third quadrant, which was already edentulous for a long time. Implants had been placed on the loci 36 and 37, but the crowns were never restored, resulting in an egression of the molars in the second quadrant.

Tooth 27 had a temporary restoration that had been there for 1 year, according to the patient (Fig. 1). A rubber dam was placed and after careful curettage, a pulp exposure could not be avoided (Fig. 2). As the



Fig. 1: Situation before treatment. There was a temporary restoration on tooth 27.



Fig. 2: Pulp exposure after careful curettage

bleeding was abundant and haemostasis was not obtained after several minutes, it was decided to do an endodontic treatment in that session (Fig. 3). With the caries extending very deep at the mesial side, a deep marginal elevation (EQUIA Forte, GC)¹⁻⁴ was carried out before the endodontic treatment (Fig. 4; endodontist: Dr. Paul Marchal).

After wax-up, a temporary bridge was made and placed on the implants on loci 36-37 to restore an ideal occlusion curve.

The tooth was treated, the marginal elevation was perfectly sealed, but the mesial emergence profile was a bit flat. It was decided to modify this emergence profile using a double-matrix system during the final reconstruction of the tooth.

Upon isolation of the field, four teeth are systematically exposed through the rubber dam to have a wide and open operatory field. The provisional restoration on tooth 26 was removed before the preparation to improve



Fig. 3: Radiograph after endodontic treatment

visual access. It would be replaced before the impression taking and of course, the contact point would be adjusted.

As the sealing of the initial deep margin elevation was perfect, it was decided not to remove the EQUIA Forte entirely and to adhere the restoration on top.⁵ EQUIA Forte's compressive strength allows to choose this option.⁶

The entire surface was etched with phosphoric acid for 15 seconds (etch-and-rinse mode).

Next, a layer of G2-BOND Universal 1-PRIMER was applied, and after 10 seconds, it was carefully dried with maximum air pressure to remove the residual water from this hydrophilic layer.

Thereafter, G2-BOND Universal 2-BOND was applied and gently spread with air to leave a sufficiently thick hydrophobic layer and light-cured. The mesial wall of the restoration was



Fig. 4: After endodontic treatment and deep marginal elevation.

built up with composite (Essentia, GC, Light Enamel). Prior to its application, G-ænial Universal Injectable was placed on the bottom of the mesial cavity to ensure the marginal seal.

The core of the restoration was reinforced with EverX Flow⁷ which needs to be covered by composite. Therefore, it is wise to do the necessary occlusal reduction before starting the reconstruction of the core. (Figs. 5-6)

It was decided to make a partial restoration that would cover the tooth completely because of three reasons:

1. The cavity width
2. Correction of the egression
3. Increase of the mechanical resistance of the tooth because of the antagonists on implants

The preparation of the tooth would be flat and non-retentive, requiring adhesive cementation.⁸

The restoration margins were completely in enamel with the

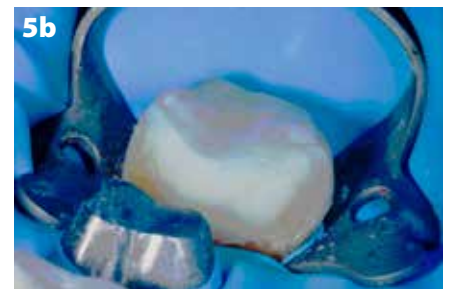
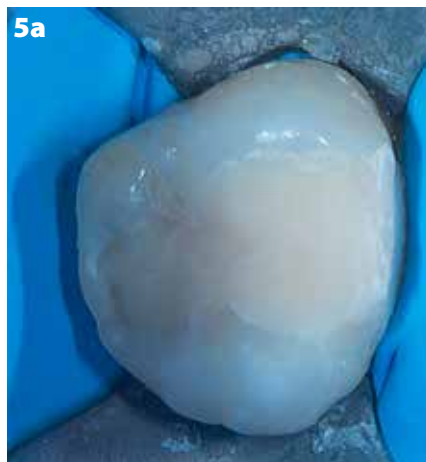


Fig. 5: Direct restoration with everX Flow (GC) and Essentia (GC)

exception of the elevated mesial margin. This approach avoids a too extensive mutilation and enables to preserve a large part of the tooth (tissue economy).

It is still often assumed that a devitalised tooth is more fragile than a vital tooth. The decrease in flexural resistance is only 6% compared to a vital tooth. The main reason of the weakening is because of tooth tissue loss⁹⁻¹⁰

After finishing the preparation (Fig. 7), the margin was smoothed with a fine

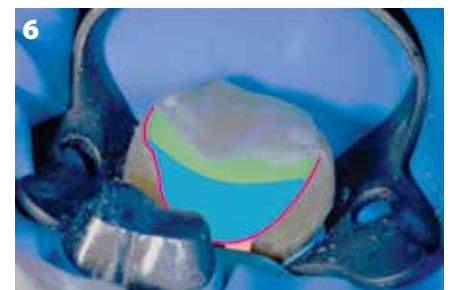


Fig. 6: Pink: Two-step universal bonding system (G2-BOND, GC); Blue: Fibre-reinforced composite (everX Flow, GC); Green: Composite (Essentia, GC).

bur (red stripe); white Arkansas stones can also be used.

A digital impression was taken and sent to the prosthetic laboratory. A bis-GMA provisional restoration was created after an impression of the prosthetic project. It was not bonded but just stabilised with 2 dots of flowable composite on the palatal and vestibular enamel.

In the next session, the lithium disilicate overlay (Initial LiSi Press, GC; Fig. 8) was tried in to check the fit and approximal and occlusal contacts. Before cementation, rubber dam was placed with a clamp on the 27 and 4 teeth exposed to have a wide operatory

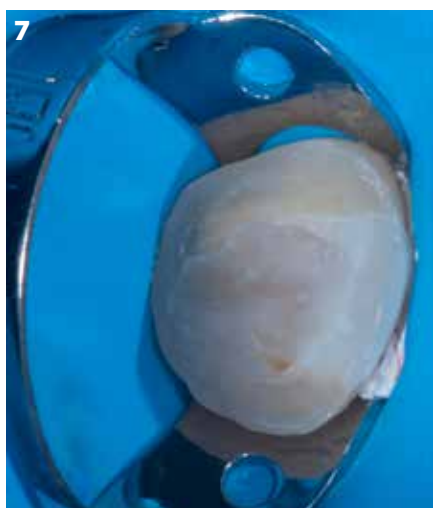


Fig. 7: Tooth after preparation, leaving a relatively flat, non-retentive surface.



Fig. 8: Lithium disilicate overlay (Initial LiSi Press, GC).

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Fig. 9: A wide operatory field facilitates the cementation procedure



Step by step video: Conditioning of Initial LiSi Press



Fig. 10: Etching with phosphoric acid (etch-and-rinse approach)



Fig. 11: Application of 1-PRIMER



Step by step video: G2-BOND Universal application



Fig. 12: Application of 2-BOND

field. Liquid dam was used around the coronal preparation to have a perfect isolation. The provisional on tooth 26 was removed prior to the cementation to have direct access to the proximal margin and the preparation was air-polished with a calcium sodium phosphosilicate powder (AquaCare Syc, Velopex) to clean the surface (Fig. 9).

The preparation was rinsed and dried thoroughly, not leaving a single trace of moisture.

Prior to bonding, the overlay was ultrasonically cleaned and dried.

The inside of the restoration was checked to ensure that no stains were left on the edges of the intaglio surface.

These should be removed by sandblasting with 50 μm Al_2O_3 to avoid that adhesion to the tooth would be impaired.

Then, the intaglio surface was etched with hydrofluoric acid for 20s. Potential traces of metallic salts were removed by applying phosphoric acid for 2 minutes and 30 seconds.¹¹⁻¹² The silane-containing G-Multi PRIMER (GC) was applied without rubbing, spreading it out gently with a brush and left on for a minute. Some advice at this stage to heat the silane with a hairdryer.¹² The restoration was then ready for adhesive cementation. The prepared surface of the devitalised tooth was etched for 30 seconds (Fig. 10), thoroughly rinsed and dried. Next, G2-BOND Universal was applied in

the same manner as described previously (Figs. 11 and 12).

One of the interests of this universal adhesive resides in effectively bridging the transition from the hydrophilic dentin to the hydrophobic resin. Because 1-PRIMER is HEMA-free, the water can be removed from the interface more efficiently. Another advantage of the primer is that it contains photo-initiator: this ensures that the deeper layers of the interface are more efficiently cured.

In addition, 2-BOND is free of HEMA and MDP; it has a solvent-poor composition. This bonding is inherently hydrophobic.

“Science and experiments are of course important, but if you already have this knowledge, common sense will be your everyday guide.”



Fig. 14: G-ænial Universal Injectable (GC) was applied on the inner surface of the restoration and also a bit on the preparation itself.

The cured adhesive (primer + bond) is hydrophobic of nature. Therefore, the occurrence of hydrolysis decreases over time, which is the biggest concern in adhesive dentistry with regard to the sustainability of the adhesive layer.

The fact that this adhesive is applied in two steps is beneficial for its stability and efficiency. Universal bonding systems are often blended in a single solution, which can lead to a reduction of the stability of the components over time.¹³

After the application of both layers, the adhesive was light-cured (D-Light Pro, GC). It should be emphasised that the performance of the curing light should be tested regularly in the dental office. If the light intensity is too low, the adhesive might not be entirely cured and the bond strength can be impaired. Therefore, it's useful to have a testing device in your practice to check your light regularly.¹⁴



Step by step video: Luting with G-ænial Universal Injectable

In this case, G-ænial Universal Injectable (GC) was used for the luting. It was applied on the intaglio surface of the restoration and also a bit on the preparation itself (Fig. 13). The seating of an overlay that is not perfectly fitting on this type of flat, non-retentive preparations can be delicate as it tends to slip away (Fig. 14). Excess of the composite was removed with a probe, microbrush and a flat brush to finish (Fig. 15). It's better to leave too much luting agent than not enough. The margin was photopolymerised for 1 minute from each side. Before the final polymerization, glycerine gel was applied (Fig. 16) to avoid the formation of an oxygen inhibition layer (and consequent discoloration). The margin was then further finished using a spoon blade (Viper, size 4; Fig. 17) and polishing tips.



Fig. 17: Finishing of the margins using a size 4 spoon blade.



Fig. 14: Seating of the lithium disilicate (Initial LiSi Press, GC) restoration



Fig. 15: Excess removal



Fig. 16: Final polymerization under glycerine gel



Step by step video: Finishing of margins after luting

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Usually, a radiography should be taken to verify that no cement excess is left interproximally (Fig. 18). If this ever would be the case, those are preferably removed with a metal strip that has a smooth part and that can be easily inserted at the contact point. The cemented overlay fit seamlessly with the tooth, without debris at the margins (Fig. 19).

Conclusion

After having tested G2-BOND in the clinical practice for one year, on vital and non-vital teeth, in three-step mode as well as immediate dentine sealing (IDS), no detachments or post-operative sensitivity occurred. This adhesive has many promising features; the few studies that have already been conducted showed impressive results, rivalling current gold standards.

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Fig. 18: X-ray after cementation of the onlay, showing good marginal adaptation and absence of cement excess.



Fig 19: Clinical result after cementation

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