

# Solving the problem of postoperative complications of Class I restorations

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## Introduction

In the recent years there has been a rapid improvement in the physical properties of the composite materials and adhesive systems that certainly helped dentists to improve the quality of their work. Shrinkage of composite materials today is lower than before, their strength and wear resistance have increased, and aesthetic rates are comparable to the aesthetics of natural teeth. But, unfortunately, the problem of the polymerization stress has remained to the present time. Shrinkage of the composite material during polymerization causes stress in the composite, the adhesive layer and the tooth tissues. The intensity of the stress depends on such factors as cavity configuration (C-factor), the physical properties and composition of the composite material. The result of the polymerization stress is a number of complications - micro leakage, post-operative sensitivity, cracks in the tooth, subsequent secondary caries and others. To prevent such problems during performing restorations with classic composite materials it's recommended to use flowable composites as an adaptive layer (creating the 'elastic cavity wall'), as well as perform placement of the composite in small portions during filling the

cavity ('incremental' technique). [1] Such approach is familiar to the dentists but require a lot of time for restoration of each tooth as during the work the clinician has to insert into the cavity and adapt multiple number of layers of the composite material. That is why bulk fill materials are increasingly popular. They help solve the problem of polymerization stress and reduce the amount of time spent on the restoration of the tooth. One of such materials, Filtek™ Bulk Fill Posterior Restorative, is used a lot in dental practices world-wide and daily helps us to do a better job.

## Clinical case

The patient came to the dental office with complaints about increased sensitivity of the posterior teeth of the lower jaw on the right while eating sweets. During the examination the poor quality restorations of teeth 4.6, 4.7 with micro leakage, numerous cracks and color change along the border between the restoration and the tooth were found (Fig. 1). To minimize polymerization stress, save time during the treatment without compromising the strength and the wear resistance of the restoration it was decided to make a direct restoration of the teeth with Filtek™ Bulk Fill Posterior composite material.

## Isolation of the working field

When working with composite materials the use of the isolation will help to make the adhesive procedure more predictable and will provide a dry working field and retraction of the soft tissues surrounding the tooth. But in this case the application of a clamp for fixing the rubber dam material has certain difficulties – a tooth 4.7 has a low clinical crown and there is no possibility to rigidly fix the clamp on it. There is a simple solution to this problem: 36% phosphoric acid is applied on the area near the gingiva on the buccal wall of the tooth in two places and after 5 seconds washed out with the plenty of water, then a piece of the composite material is placed on the surface (composite shoulder), which after the polymerization will perform the function of holding the clamp on the tooth. After the placement of the rubber dam all possible leaks are sealed with gingival protector (Fig. 2).

## Preparation step

Old restorations were removed with the diamond burs (diamond particle size is 120-140 microns), the universal carbide bur (SS-White SSW FG-1702SL) was used for preparation of carious dentin, enamel walls of the cavities were treated with fine-grain diamond burs (diamond particle size is 25 microns) and polished with

"Kenda" polishing cup for a better fit of the restoration. [2] The result of the preparation is two Class I cavities, teeth 4.6 and 4.7. (Fig. 3).

## Adhesive protocol

To prevent postoperative complications and provide proper adhesion of the composite to enamel and dentin an adhesive protocol using selective enamel etching was performed. Phosphoric acid was applied on the enamel edges of the cavity for 10 seconds (Fig. 4), fully washed out with water. After drying the teeth, a self-etch adhesive was used in the cavity, agitating the dentine for 20 seconds (Fig. 5). The adhesive was dried until formation of a smooth shiny film and then polymerized for 10 seconds (Fig. 6).

## Flowable composite use

Many authors describe the use of flowable composite underneath posterior restorations. Improved adaptation and contribution to lower post-operative sensitivity have been given as reasons for this. Although Filtek™ Bulk Fill Posterior is very flowable upon extruding, the author also prefers to apply a layer of flowable composite prior to placing the composite restorative [3M]. [3] In this clinical case, for this purpose Filtek™ Bulk Fill flowable composite was placed on the dentin in an increment of about

0.5-0.7 mm and polymerized afterwards (Fig.7).

## Composite restoration

The further restoration was performed with Filtek™ Bulk Fill Posterior Restorative material (Shade A2). The product has high strength and wear resistance, good polishing, self-adaptation, it allows placement in an increment up to 5 mm and has low modulus of elasticity to prevent development of postoperative complications. [4] Filtek™ Bulk Fill Posterior was placed into the cavity directly from the capsule in one large portion (Fig. 8), and then adaptation of the upper layer was performed with the large ball burnisher bur (Fig. 9) to make an occlusal surface.

Anatomy of the occlusal surface was performed with thin LM-Applica and LM-Fissura tools using the technique of direct carving (Fig. 10-13). The excess of the composite material from a tooth-restoration border was removed with a synthetic fiber brush, slightly moistened with the modelling resin (Fig. 14). Polymerization of the composite material was made for 20 seconds (Fig. 15). With the power of curing light of 1000 mW/cm<sup>2</sup> this time is sufficient for the full polymerization of Filtek™ Bulk Fill Posterior at the entire depth of the cavity.

## Finishing of the restoration

On the Fig. 16 and 17 the restorations before finishing and polishing are shown. After the rubber dam removal, the composite shoulder was removed from the buccal wall of the tooth using an ultrasonic tip for removing dental plaque, and the remaining of the composite was polished with the SS-White 12-sided carbide bur during finishing and occlusal adaptation of the restoration. Finishing and polishing of the restoration to a "dry light" were performed with a two-stage polishing system: Sof-Lex™ Spiral Wheels (beige and white).

## Final result

The X-Ray showed that the material has an excellent radiopacity and adhesion to the cavity walls (Fig. 18). The amount of time consumed on the restoration of two teeth with Filtek™ Bulk Fill Posterior Restorative was equivalent to the amount of time which is usually taken to treat one posterior tooth, which is an additional advantage for both dentist and the patient. The final result of the restoration after polishing is shown on the Fig. 19. Long-term result in 10 months after the restoration is shown on the Fig. 20.

## Conclusions

With this technique using bulk fill nanocomposite materials such as Filtek™ Bulk Fill Posterior the author has less post-operative sensitivity issues than with multi-layer composite placement [3M]. In addition, using the material in one layer up to 5 mm allows dentists to significantly reduce the amount of working time without sacrificing the quality of work. <sup>[5]</sup>

Full list of references is available from the publisher.

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Fig. 1. Initial clinical situation. Teeth 4.6, 4.7 have unsatisfactory restorations with microleakages, color changes along the restoration-tooth border.



Fig. 2. Isolation of the working field with the latex curtain



Fig. 3. Old restorations are removed from the teeth, preparation of carious dentin is performed, cavities are prepared for further restorations

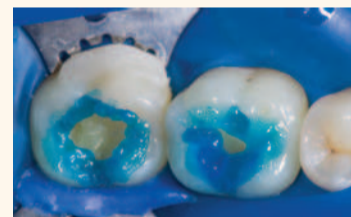


Fig. 4. Selective etching of the enamel with 36% phosphoric acid for 10 seconds



Fig. 5. Application of Single Bond Universal adhesive



Fig. 6. 10-second polymerization of Single Bond Universal adhesive



Fig. 7. Application of Filtek™ Bulk Fill Flowable composite as an adaptive layer on the bottom of the cavities



Fig. 8. Application of Filtek™ Bulk Fill Posterior (shade A2) after the polymerization of the adaptive layer



Fig. 9. Adaptation of the top layer of the Filtek™ Bulk Fill Posterior with a ball burnisher bur



Fig. 10. Shaping the distal buccal cusp of the tooth 4.6 with LM-Applica tool



Fig. 11. Shaping the mesial lingual cusp of the tooth 4.6 with LM-Applica tool



Fig. 12. Shaping the fissures of the tooth 4.6 with LM-Fissura tool



Fig. 13. Position of the LM-Fissura tool during the process of creating the tooth shape



Fig. 14. Removal of the excess of material from the border tooth-restoration with synthetic fiber brush

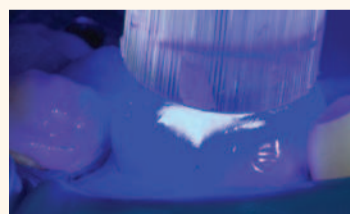


Fig. 15. Curing of the composite for 20 seconds with Elipar™ S10 Curing Light



Fig. 16. Restorations of the teeth 4.6, 4.7 before finishing



Fig. 17. Restorations of the teeth 4.6, 4.7 before finishing

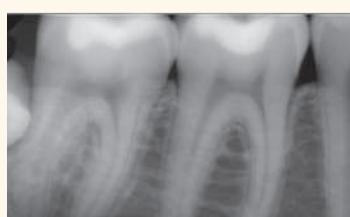


Fig. 18. X-Ray of the final restorations. The material shows an excellent radiopacity and adaptation to the cavity walls



Fig. 19. Final restorations after the occlusal adaptation, finishing and polishing



Fig. 20. Restorations after 10 months