

Consensus statements on bulk fill resin composites

Richard Price¹

Introduction

In the context of this document, bulk fill materials are lightcured, resin-based composites that can be placed in increments of 4 mm (or in a few cases 5 mm) according to the manufacturer.

It is strongly recommended that before using a product, the clinician read and understand the manufacturer's instructions for use (IFU) because, although different products may appear to be similar, proper procedures can differ significantly among brands and even among shades of the same composite. (Figure 1) Using a bulk fill resin composite (BRC) does not mean that you can bulk cure all restorations with just one light exposure.

Bulk fill resin products can be divided into two subgroups:

- Flowable BRC
- Sculptable, high viscosity BRC

Using the bulk fill and bulk cure approach may save time, reduce the risk of contamination, and reduce the formation of voids (entrapped air) that can be produced when multiple increments of resin are used to restore a tooth. To ensure that the anticipated increment thickness does not exceed the manufacturer's recommended

Before you start

Shade	Exposure Time
A1	10s
A4	20s

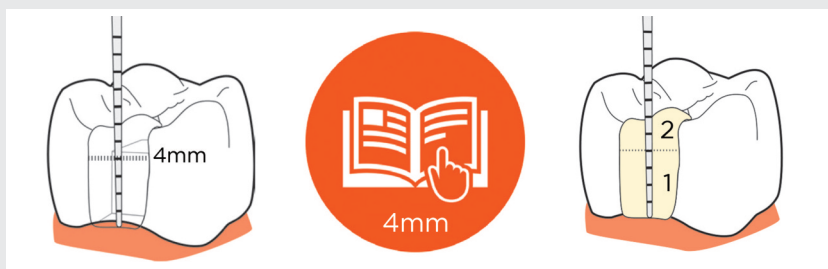


Figure 1

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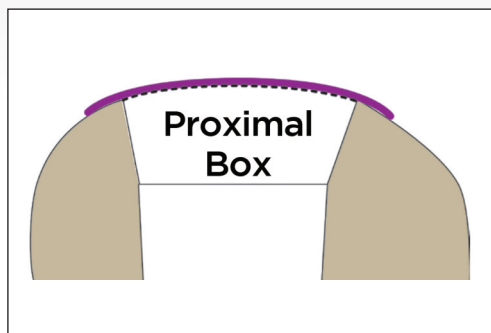
Before you fill a Class II ...

Figure 2

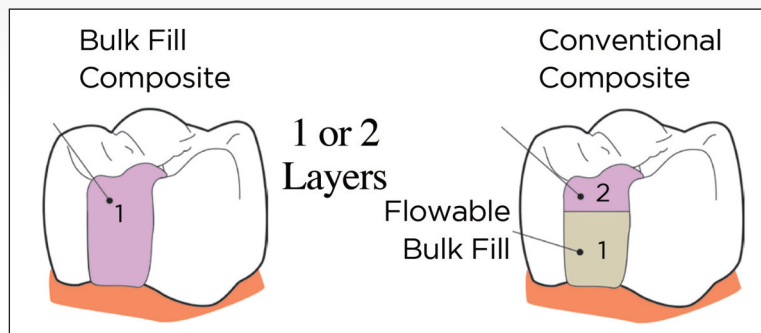
When you fill

Figure 3

thickness, clinicians should measure the maximum preparation depth. In deep preparations, two or more layers of BRC may be necessary. (Figure 1)

Material Properties

In general, the mechanical properties of BRC are similar to those of conventional, hybrid resin composites. The flowable BRCs can have significantly less filler volume, a lower elastic modulus, and lower hardness than the sculptable, high viscosity BRCs or the traditional, hybrid composites. In general, the translucency of BRCs is greater than those of conventional, hybrid resin composites. This allows more light to penetrate to the bottom of the restoration and improves the depth of cure; however, the BRC may appear somewhat grey in the mouth. Thus, esthetic requirements must be taken into account when using a BRC.

Increased debonding at the pulpal floor of deep Class I and II restorations has been reported when bulk curing some BRCs, compared to when an incremental filling technique was used. This observation remains under investigation.

Some, but not all, BRCs use larger filler particles. Historically, composites with large filler particles have generally shown higher wear rates, which may be clinically relevant if the BRC is not capped with a typical microhybrid or nanohybrid composite. Also, most flowable BRCs should be capped with a traditional sculptable composite to create the occlusal anatomy and to provide an esthetically pleasing, strong and wear-resistant surface. (Figure 3)

Guidelines for success

Most of the following recommendations are valid for all light curing composites, not just only for BRCs. The amount of light energy (Dose = Incident Irradiance x Exposure Time) required to ensure sufficient curing of BRCs is not the same for all

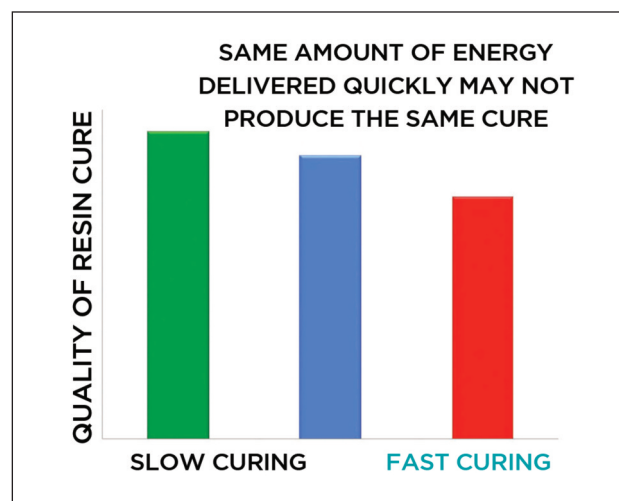
When you Light Cure

Figure 4

products, and the manufacturer's IFU should be followed closely. (Figure 1)

Recommendations

- Check that the matrix band is anatomically adapted and that there is a tight fit especially at the cavosurface margin of the proximal box. (Figure 2)
- Light cure the adhesive and the composite in the distal and the mesial boxes separately.
- Pay attention when bulk filling, as it is easy to trap air at the corners of the preparation. (Figure 3) Although warming the composite may help, further studies are required to confirm the benefits of warming.
- The basic premise of exposure reciprocity is invalid and should not be relied upon to calculate minimum exposure

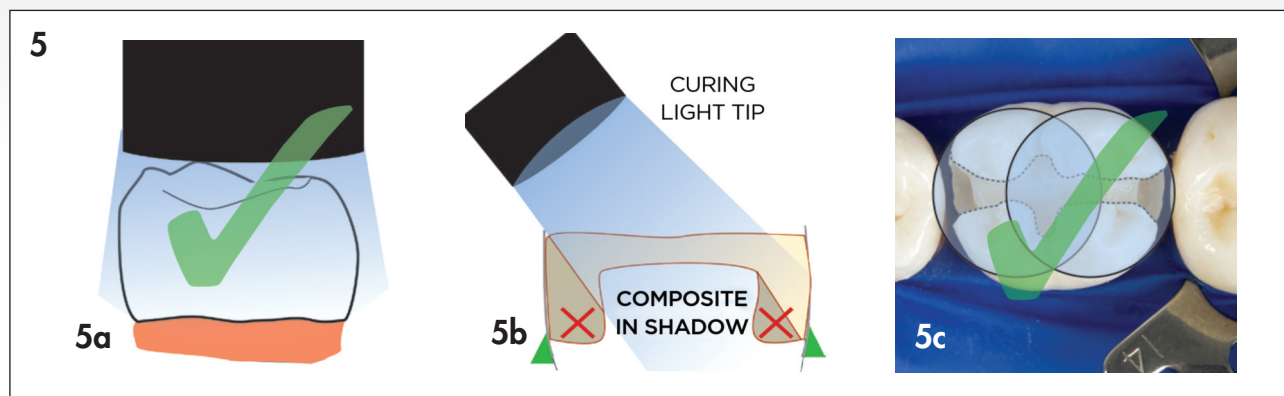


Figure 5

times. If the manufacturer recommends delivering 1500 mW/cm² for 10 seconds, this does not mean that the resin properties will be the same if 5000 mW/cm² is delivered for 3 seconds, despite the fact that, in both cases, the resin would receive the same amount of energy: 15 J/cm². (Figure 4)

- Using today's composites, light curing units that deliver greater than 2000 mW/cm² and claim short curing times (<10s) should be used cautiously, unless clinical studies can verify the claims about the BRC you are using. Based on the success achieved with longer curing times (10 to 20 seconds), irradiance levels between 1000-1500 mW/cm² are preferable.
- It is critical to orient the light source directly over and at 90° to the portion of the restoration being light cured. (Figure 5a)
- Be aware that preparation design and presence of the

matrix band may cause light shadows. (Figure 5b) To provide the best light delivery, intentionally move and adjust the angle of the light tip to eliminate these shadows. Increase exposure time as necessary.

- Be aware of the light tip diameter, size of the preparation and the planned restoration. Resin that is at (or beyond) the edge of the light tip is unlikely to be adequately cured. (Figure 5c)
- Due to the tooth anatomy, its location in the mouth, and the matrix band, the light tip position may be farther away than desired from the BRC being light cured. This effect is greater in deep preparation areas (e.g., the bottom of proximal boxes). Be aware of these issues and compensate by increasing exposure times.
- After removing the matrix band, supplemental light curing from the buccal and lingual directions is highly recommended. (Figure 6)
- Deliver sufficient amounts of light energy to successfully cure the BRC, but without overheating and damaging the tooth pulp or surrounding exposed gingival tissues. A short 3s delay between light exposures, blowing air, or using high volume suction to draw air across the tooth can reduce the increase in intrapulpal temperature.

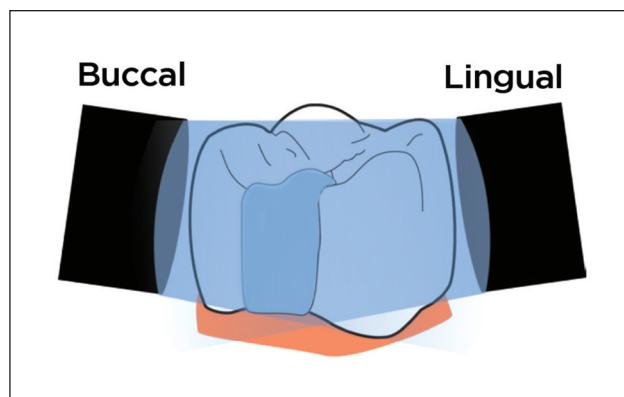


Figure 6

Clinical results

So far, no clinical studies show that BRCs are superior to traditional, incrementally placed composites. Some published clinical data show that a few flowable BRC products can be as successful as traditional, incrementally placed composites. More long-term clinical studies are needed before definitive statements can be made about the overall performance of these two groups of products.

Conclusion

BRCs continue to show promise. Based on available in vitro and in vivo research results, most BRCs can be expected to be equivalent to conventional, incrementally cured resin composites in posterior, stress-bearing locations. However, most flowable BRCs will have higher wear rates and should be capped with conventional resin composites or high-viscosity BRCs. Incrementally placed composite remains the 'gold standard' until more long-term (5+ years) clinical studies provide evidence of similar performance between the two types of products and techniques.

Suggested Additional Reading

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